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FREDRICK ACCUM (See page 653)

THE
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VOL. VIII DECEMBER, 1916 No. 12

RECENT WORK ON NORMAL ADULT NUTRITION

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This paper is a review of some of the recent work on normal adult nutrition. It follows Dr. Wheeler's[1] excellent survey in last November's JOURNAL, and includes roughly papers published between August, 1915, and August, 1916, inclusive, with occasional mention of earlier work. The effort has been made to cling closely to the subject, so that questions of growth, including all work on vitamines, and nutrition in disease have been omitted. The author has tried to choose from the mass of material what is most interesting and important to students of nutrition, but more or less arbitrary selections have sometimes of necessity been made.

FATS

On the digestibility of fat two papers have appeared. Langworthy and Holmes[2] of the office of Home Economics, States Relations Service, incorporated four animal fats, butter fat, lard, beef and mutton fat, in a blanc mange made of skimmed milk, corn starch, and sugar flavored with caramel, thus disguising the fatty taste, and distributing the fat evenly through the food, and fed this in a simple diet. The coefficients of digestibility found varied from 97 per cent for the butter fat and lard, 93 per cent for the beef, to 88 per cent for the mutton fat, thus ranging the fats in the order of their melting points (32, 35, 45 and 50°)

[1] Wheeler, Ruth, Recent contributions to the foundations of dietetics. *Jour. Home Econ.*, 7, (1915), pp. 469–479.

[2] Langworthy, C. F., Holmes, A. D., Digestibility of some animal fats. *U. S. Dept. Agr. Bul.* 310, (1915).

and also controverting the popular notion as to the indigestibility of lard. The increasing use of hydrogenated oils like crisco gives value to experiments[3] on the comparative digestibility of lard and a vegetable oil hydrogenated in the laboratory, both giving coefficients of about 96 per cent. The fats in these experiments were fed in potato chips.

Especially interesting on the subject of fat metabolism, are Bloor's papers. He is now working especially with the fat, "lipoids," of the blood.[4] His methods distinguish between true fats, phosphatides (lecithin, cephalin, etc.) and the higher alcohol cholesterol with its fatty acid esters. These are logically grouped together not only because of their solubility in the ordinary fat solvents, but because they are all probably concerned in fat metabolism. In Bloor's experiments the lecithin of the blood was increased 20 per cent after feeding fat to fasting animals, and from this and other evidence he concludes that probably all absorbed fat passes through a lecithin stage, that fat is probably the inactive form, the form in which the lipoids are stored, and lecithin is the first step in their utilization.

With this increased understanding of the importance of one class of phosphorus compounds in the body, the phosphorized fats, should be mentioned the report of some work done at the request of the Council on Pharmacy and Chemistry of the American Medical Association on two phosphorus compounds popularly used as tonics. The first, Marshall's[5] on glycerophosphates, emphasizes the fact that the organism can assimilate phosphorus as readily from inorganic as organic forms, that the glycerophosphates are split up in the intestine into inorganic phosphates and that glycerophosphates are in no way superior to phosphates. "Glycerophosphates will continue to be manufactured until physicians refuse to prescribe them." The second is Marriott's[6] experiments and report on hypophosphites: "There is no reliable evidence that they exert a physiological effect; it has not been demonstrated that they influence any pathologic process; they are not 'foods.'

[3] Smith, C. A., Miller, R. J., and Hawk, P. B., Studies on the relative digestibility and utilization by the human body of lard and hydrogenated vegetable oil. *Jour. Biol. Chem.*, 23, (1915), pp. 505–511.

[4] Bloor, W. R., Fat absorption and the blood lipoids. *Jour. Biol. Chem.*, 23, (1915), pp. 317–326. Fat assimilation. *Ibid.*, 24, (1916), pp. 447–460. The distribution of the lipoids ("fat") in human blood. *Ibid.*, 25, (1916), pp. 577–599.

[5] Marshall, E. K., The therapeutic value of organic phosphorus compounds. *Jour. Amer. Med. Assn.*, 64, (1915), p. 573, and Editorial, *ibid.*, 66, (1916), p. 1205.

[6] Marriott, W. McKim, The therapeutic value of the hypophosphites. *Jour. Amer. Med. Assn.* 66, (1916), pp. 486–488.

If they are of any use, that use has never been discovered." In this and other connections Forbes'[7] summary of mineral nutrients in human dietetics is of much interest.

SUGARS

The subject of the assimilation limit of sugars has been reopened with the result that the figures which have persisted for years in some of the text books will have to be abandoned. Taylor and Hulton[8] of the University of Pennsylvania make the statement that apparently in the majority of healthy male adults there is no limit of assimilation of glucose. A group of medical students ingested the purest glucose in the form of a syrup in quantities ranging from 200 to 500 grams glucose, the latter amount being difficult to take and retain even by their most practiced young men. Of nine subjects taking 300 grams only three showed glycosuria, of six taking 400 grams only two, and of the five taking 500 grams only one. Thus the experimenters reached a "limit of ingestion" of the glucose but no general limit of assimilation. These larger quantities of glucose showed no marked influence on the sugar of the blood and no intestinal disturbances. Levulose, on the other hand, did cause intestinal disturbance when 300 grams were taken, whether because of inherent difference or some associated impurity was not known.

A quite different method for studying the tolerance of the system to sugars is to inject the sugar solution intravenously at a constant speed. The uncertain factors of digestion and absorption are thus eliminated. Woodyatt and his associates[9] at Rush Medical School report experiments with his improved machine showing extraordinarily high quantities of glucose injected without glycosuria. A normal man of 70 kg., resting quietly in bed may actually receive and assimilate 63 grams glucose per hour. This is equivalent to 252 calories per hour or at the rate of 6048 calories per day. The injections have been continued for two and a half hours on men and as long as twelve hours on animals. The normal tolerance limit for glucose is established at about 0.85 grams glucose per kilogram per hour for an indefinite time. For levulose the

[7] Forbes, E. B., The mineral nutrients in practical human dietetics. *Jour. Home Econ.*, 8, (1916), pp. 122–130.

[8] Taylor, A. E., and Hulton, Florence, The limit of assimilation of glucose. *Jour. Biol. Chem.*, 25, (1916), pp. 173–175.

[9] Woodyatt, R. T., Sansum, W. D., and Wilder, R. M. *Jour. Amer. Med. Assn.*, 65, (1915), pp. 2067–2070.

value is only one-sixth that for glucose—0.15 gram; for galactose 0.1 gram; and for lactose near zero as known before. The authors say that the method employed might be "of general interest as a means of studying problems of absorption, metabolism, and elimination, and have therapeutic application."

Sansum and Woodyatt[10] have also determined the food value of commercial glucose or corn syrup in a novel way. They fed it to phlorizinized and glycogen-free dogs, and for controls fed chemically pure glucose. The sugar from the various carbohydrates should not be burned but eliminated in the urine. The commercial glucose yielded 95.48 per cent as much extra sugar as the pure substance and so was "capable of passing through whatsoever physiological processes of digestion, absorption, and assimilation are necessary for its ultimate existence in the body as *d*-glucose. Commercial glucose has also been fed[11] to rats as an important part of their diet, with entirely satisfactory results as to growth and reproduction, the experiment proving, therefore, the probably complete availability of the different carbohydrates present and the entire absence of any deleterious by-products. These various experiments should lay to rest the prejudice still remaining in some minds against this valuable food material.

The quickness with which the energy of the sugars is available to the body is quite notable. It may be shown by short time determinations of the respiratory quotient. Sucrose, lactose, levulose, and also alcohol, begin to be burned in appreciable quantity in five to eleven minutes; glucose and maltose require a longer time, from twenty to thirty minutes.[12]

Of significance in connection with metabolism of fats and carbohydrates is the great amount of recent work on acidosis. Most of it is on pathogical subjects and is therefore not discussed here, but a paper[13] from the Nutrition Laboratory and the Peter Bent Brigham Hospital,

[10] Sansum, W. D., and Woodyatt, R. T., The use of phlorhizinized dogs to determine the utilizable carbohydrates in foods. The food value of commercial glucose. *Jour. Biol. Chem.*, 24, (1916), pp. 23–29.

[11] Carlson, A. J., Hektoen, L., and LeCount, E. R., Effects of commercial glucose when fed to white rats. *Jour. Amer. Chem. Soc.*, 38, (1916), pp. 930–936.

[12] Higgins, H. L., Rapidity with which alcohol and some sugars may serve as nutriment. *Amer. Jour. Physiol.*, 41, (1916), p. 258.

[13] Higgins, H. L., Peabody, F. W., and Fitz, R., A study of acidosis in three normal subjects with incidental observations on the action of alcohol as an antiketogenic agent. *Jour. Med. Research.*, 34, (1916), pp. 263–272.

Boston, deals with its production in three normal subjects by several days use of a carbohydrate-free diet—eggs, meat, fish, butter, and sugar-free cream. The resulting acidosis was measured by most of the methods now used for the purpose the—diminution of the alveolar carbon dioxide resulting from the presence in the blood of abnormal acids which unite with the available alkali and so diminish the carbon dioxide binding power, the increase of urinary ammonia, titratable acidity, and acetone bodies. Alcohol failed to check the acidosis. The most prominent subjective effects were "loss of appetite, lack of energy, heaviness of the head, and a peculiar feeling of malaise." The first carbohydrate meal brought about immediate improvement.

NITROGEN COMPOUNDS

Surprising to many students of diet are Bateman's[14] results (Yale, on the digestibility of raw egg-white. He worked with dogs, rats) rabbits, and men. This article deals chiefly with the results from the first three. The experiments on men are to be reported in detail later, but Bateman says that the results are closely similar to those with the other animals. The uncooked egg-white fed in fairly large quantity produced diarrhea, 4 to 5 eggs to dogs weighing 5.5 to 7 kg. and 5 to 7 eggs to 10 to 12 kg. dogs. A water extract of the feces showed considerable coagulable protein, the unchanged egg-white; from 30 to 50 per cent of the ingested white could be recovered as coagulum. The diarrhea followed the ingestion of the egg-white whether taken alone, beaten with milk, mixed with cracker-meal and lard, or mixed with cracker-meal and lard and flavored with extract of beef. On a meat diet with the experimental animals the per cent of utilization of the nitrogen ranged from 94.7 to 95.2, but on the raw egg-white from 49.8 to 69.0. The utilization improved when the diet was continued, being 86.7 per cent on the tenth day. If the egg-white was cooked the diarrhea stopped and the utilization rose to 90 per cent. Heating to 55° C. before feeding did not prevent the diarrhea, 55° to 60° considerably decreased it, and 70° or above prevented it entirely. The raw egg-white is attacked with much difficulty by the digestive enzymes, possibly because of their adsorption by it. Egg-yolk behaved quite differently, being well utilized either raw or cooked unless fed with too much other fat.

[14] Bateman, W. G., The digestibility and utilization of egg proteins. *Jour. Biol. Chem.*, 26, (1916), pp. 263–291.

Bateman concludes with the statement: "In current dieto-therapy raw whole eggs, raw egg-white, and albumin-water are extensively prescribed. There appears to be little in their conduct as foodstuffs, however, to warrant such faith in their nutritive value or ease of assimilation."

Another false dietetic idea which has long persisted in this country is the harmfulness of very young or "bob" veal. The European custom has not made the discrimination but our federal and state laws prohibit the sale of calves less than three to six weeks old. Berg[15] of the Bureau of Animal Industry reports that chemical analysis of mature beef and immature veal brings out no differences that are dietetically significant, that the two digest in vitro at the same speed, and that young animals (cats) obtaining their only nitrogen from immature veal grow normally, and a pair after living on it for two-thirds of a year produced normal young. Later the Office of Home Economics[16] undertook experiments on man to continue the work. First a number of individuals and families were given the very young veal cooked in different ways and found it entirely satisfactory and not conducive to any illness or distress. It was thought by some to be rather tasteless, and if roasted it presented a less appetizing appearance than the mature meats because of the greater shrinkage in cooking due to the loss of water from the larger quantity. The veal not more than five days old averaged 76 per cent water, and market veal 72 per cent. The coefficients of digestibility determined on a group of young men were practically the same for the protein of the two veals—93 per cent. An editorial[17] in the *Journal of the American Medical Association* in commenting on the first of these papers on veal says that "it relieves food chemists and physicians from the embarrassment of having to confess, in the practical world, that they do not know why veal is not so good a food as beef or mutton."

The Office of Home Economics[18] has also experimented on the digestibility of hard palates of cattle. The protein is about 86 per cent assimilated, somewhat less thoroughly than that of the common cuts of meat.

[15] Berg, W. N., Biochemical comparison between mature beef and immature veal. *Jour. Agr. Research*, 5, (1916), pp. 667–711.

[16] Langworthy, C. F., and Holmes, A. D., Digestibility of very young veal. *Jour. Agr. Research*, 6, (1916), pp. 577–588.

[17] Editorial, Immature veal as food. *Jour. Amer. Med. Assn.*, 66, (1916), pp. 820, 821.

[18] Langworthy, C. F., and Holmes, A. D., Digestibility of hard palates of cattle. *Jour. Agr. Research*, 6, (1916), pp. 641–648.

A third point on which we may have to revise our ideas, more general than the young veal question, is the protein content of meat. Janney,[19] using his improved methods for separating protein and non-protein, finds that the amount of protein as usually determined exceeds that actually present by 15 to 20 per cent. Chicken and ox muscle, for instance, both contain only 16.6 per cent protein, while the determination made in the usual way on these materials gave 19.3 and 21.6 per cent. The errors in the usual figures are due to including non-protein nitrogenous compounds which contain about 13 per cent of the total nitrogen of muscle, and to using the inexact factor 6.25.

Considerable further work has been brought out on the relation between diet and uric acid. Among other papers may be mentioned Denis's[20] giving figures which show that with individuals with normal kidneys the blood shows no increase of uric acid even after feeding large quantities of purines in the diet. The normal kidneys are very efficient in removing uric acid from the body. A German investigator[21] reports on the increasing uric acid of the urine after ingestion of the yeast food recently put on the market in Germany. Ten grams of the yeast increased the output as much as 100 grams of meat. The author therefor warns persons inclined to gout or to urate concrements against yeast, even, he goes so far as to say, in ordinary bread.

Further effort has been made to measure and explain the occasional increases of urinary uric acid on diets free from purines. Taylor's short paper[22] of two years ago showed a uric acid excretion nearly three times as large on a purine-free high protein diet (egg-white) as on a practically nitrogen-free diet of purified starch and cane sugar. In some much more elaborate experiments Mendel and Stehle[23] found that the hourly excretion of uric acid in man increased over the fasting output very slightly when sucrose was fed, not at all with fat, and markedly with protein (gluten). Various laxatives had no effect,

[19] Janney, N. W., The protein content of muscle. *Jour. Biol. Chem.*, 25, (1916), pp. 185–188.

[20] Denis, W., The effect of ingested purines on the uric acid content of the blood. *Jour. Biol. Chem.*, 23, (1915), pp. 147–155.

[21] Salomon, H., *Münch. Med. Woch.*, 63, (1916), No. 13. Through *Jour. Amer. Med. Assn.*, 66, (1916), p. 1589.

[22] Taylor, A. E., and Rose, W. C., The influence of protein intake upon the formation of uric acid. *Jour. Biol. Chem.*, 18, (1914), pp. 519–520.

[23] Mendel, L. B., and Stehle, R. L., The rôle of the digestive glands in the excretion of endogenous uric acid. *Jour. Biol. Chem.*, 22, (1915), pp. 215–231.

but pilocarpine, a drug which stimulates the secretory apparatus of the alimentary tract, increased the uric acid. They conclude that "the uric acid output, aside from the portion arising from precursors in the food, depends, to some extent at least, upon the degree to which the digestive glands are called into activity."

Another open question in purine metabolism, the failure of the body to excrete uric acid corresponding to the full amount of purine in the food, has been approached[24] by feeding sodium nucleate. The purines of the urine (uric acid and bases) accounted for from only 14 per cent to 30 per cent of the purine of the nucleate. The irregular loss is probably explained by bacteriological destruction of varying intensity. A very interesting summary[25] of his own and other work on purine metabolism has been brought out by Professor Wells of the University of Chicago.

Denis's work on uric acid of normal blood mentioned above and Bloor's on the lipoids of blood is illustrative of the fact that "the center of analytical interest in both normal and pathological metabolism is shifting from the urine to the blood."[26] There are further determinations of the non-protein nitrogen of the blood (urea, amino acids, etc.), some[27] slightly higher than the earlier ones of Folin and Denis and some[28] approximately the same. Studies like these blood analyses on normal subjects are constantly increasing in number and in accuracy. Their value is plain both for an understanding of normal processes of metabolism and as a firm basis for pathology and therapy.

GASTRIC DIGESTION

Investigations[29, 30] of gastric digestion continue from this same point of view—the normal as the basis. As some of the papers consist largely

[24] Givens, M. H., and Hunter, A., Experiments upon the fate of ingested sodium nucleate in the human subject. *Jour. Biol. Chem.*, 23, (1915), pp. 299–309.

[25] Wells, H. G., Some features of purine metabolism. *Jour. Lab. Clin. Med.*, 1, (1915), pp. 164–171.

[26] Editorial. *Jour. Amer. Med. Assn.*, 67, (1916), p. 956.

[27] Gettler, A. O., and Baker, W., Chemical and physical examination of the blood in thirty normal cases. *Jour. Biol. Chem.*, 25, (1916), pp. 211–222.

[28] Bang, I., Investigation of the residual nitrogen of the blood. *Biochem. Z.*, 72, (1915). Five papers. Discussed in Editorial. *Jour. Amer. Med. Assn.*, 66, (1916), p. 1781.

[29] Talbot, E. S., The examination of normal gastric secretion by the fractional method. *Jour. Amer. Med. Assn.*, 66, (1916), p. 1849.

[30] Fowler, C. C., Rehfuss, M. E., and Hawk, P. B., Investigation of the gastric residuum in over one hundred normal cases. *Jour. Amer. Med. Assn.*, 65, (1915), pp. 1021–1025.

of figures and curves they can not well be abstracted. Carlson,[31] working on his man with a gastric fistula, reports high acidity (0.5 per cent) of the normal appetite secretion, only very slight secretion on seeing food, and much secretion, averaging 70 cc. in twenty minutes, on chewing palatable food, and in general the more palatable the food the greater the volume of the juice. One interesting point (Kast's paper)[32] is that with healthy individuals fatigue, either physical or mental, has very little effect upon gastro-intestinal motility. In patients with pathological digestive conditions fatigue does lessen motility, mental having more effect than physical. The time necessary for peptic digestion[33] may be much increased by the presence of cooked starch—the pure starch in colloidal solution, or cooked rice, potatoes, bread, etc. Dextrin does not hinder the digestion at all. That is, if cooked farinacious food is not partially digested by the saliva the pepsin is adsorbed by the starch and hence much diminished in activity. This, of course, gives a very important function to the salivary amylase.

NEW FOODS

Several new foods are being urged. Soy beans as a constituent of canned baked beans are already widely advertised. Cottonseed meal as a human food is the subject of a vigorous propaganda. The seed contains a substance, gossypol,[34] toxic to many animals, especially pigs, if taken in more than moderate amounts; the oxidation products of this substance are not harmful. The nutritive value of cotton seed meal for rats has been investigated by Richardson and Green[35] of the Department of Domestic Economy, University of Texas. They found it non-toxic.

The South Dakota Agriculture Experiment Station[36] discusses the value of millet as human food and proposes to rechristen it proso, so

[31] Carlson, A. J., et al., Chemistry of normal human gastric juice. *Amer. Jour. Physiol.*, 38, (1915), pp. 248–267. The secretion of gastric juice in man. *Ibid.*, 37, pp. 50–73.

[32] Kast, L., Effect of fatigue upon gastro-intestinal motility. *Proc. Soc. Exp. Biol. and Med.*, 13, (1916), p. 79.

[33] Maxwell, L. A. I., The relation of salivary to gastric secretion. *Biochem. Jour.*, 9, (1915), pp. 323–329.

[34] Withers, W. A., and Carruth, F. E., Gossypol, the toxic substance in cottonseed meal. *Jour. Agr. Research*, 5, (1915), pp. 261–288.

[35] Richardson, Anna E., and Green, Helen S., Nutrition investigations on cottonseed meal. *Jour. Biol. Chem.*, 25, (1916), pp. 307–318.

[36] Nansen, N. E., Proso and kaoliang as table foods. *S. Dak. Agr. Exp. Sta. Bul.* 158, (1915), pp. 147–176.

that its name will not have association with fodder. Kaoliang is a drought-resistant grain sorghum whose seed can be milled. Avocado[37] is a California fruit averaging 20 per cent fat. *The United States Department of Agriculture Bulletin* on fermented milks[38] is valuable. The many interesting efforts of the Germans to adapt themselves to a limited food supply and to utilize all possible sources of food have already been summarized in the JOURNAL.[39]

SUBSTANCES ADDED TO FOODS

New Food Inspection Decisions (164 and 173)[40] permit an eighth coal-tar color, a yellow, and forbid the use of the foam producing substance, saponin. This has been employed as a substitute for white of egg in meringues, frosting, fillings, marshmallows, etc. It serves "solely as a foam producer" giving "a fictitious appearance of body and therefore of food value," so "concealing damage or inferiority." In connection with color in foods Palmer's work on natural yellow is most interesting. The carotin, associated with the chlorophyll in green grass, etc., is not decomposed in the cow's body, but persists in the milk fat, body fat, blood serum, etc. Hence natural yellow butter can be obtained only when the carotin of the cow's food is high. The yellow in egg yolk, fowls' fat, etc., is xanthophyll.[41] Therefore when dietary whims demand yellow egg yolks, yellow corn may be fed, and for colorless poultry flesh, not yellow corn, but skim milk. The color, added or natural, is no indication of nutritive excellence.

The use of benzoic acid in ketchups is diminishing.[42] In 1910 of ketchups examined in Pennsylvania 90 per cent contained this preservative, and in 1915 only 24 per cent. The cause of the improvement is probably "the fact that manufacturers have found it cheaper in the end to maintain sanitary conditions, and effect, through sterilization of the product, the desired end, than to depend on the uncertain and

[37] Jaffa, M. E., The nutritive value of the avocado. *Univ. Cal. Agr. Exp. Sta. Bul.* 254, (1915), pp. 395–402.

[38] Rogers, L. A., Fermented milks. *U. S. Dept. Agr. Bul.* 319, (1916).

[39] Wheeler, Ruth, The war and dietetics: and Barrows, S. T., A triumph of scientific housekeeping. *Jour. Home Econ.*, 8, (1916), pp. 488 and 495. See also Lusk, G., Food economics, *Jour. Wash. Acad. Sci.*, 6, (1916), pp. 387–396.

[40] Service and regulatory announcements no. 17. *U. S. Dept. Agr. Bur. Chem.*, May 12, 1916.

[41] Palmer, L. S., Xanthophyll, the principal natural yellow pigment of the egg yolk, body fat and blood serum of the hen. *Jour. Biol. Chem.*, 23, (1915), pp. 261–279.

[42] La Wall, C. H., *Dept. Agr. Dairy and Food Bureau, Harrisburg, Pa., Bul.* 272.

questionable efficiency of a preservative." Also sodium benzoate which before the war sold for less than fifty cents a pound, at the time of the bulletin was more than $5. "The sodium benzoate controversy bids fair to be settled in a most interesting and unexpected manner."

ENERGY

Determinations of the energy production of the human machine, so important to scientific dietetics, have continued, some of the results being rather surprising. The energy production in fast walking[43] is nearly twice that in slow, but in running it is slightly lower. For walking one meter slowly 0.5 small calories per kilogram body weight are produced, 0.932 for fast walking, and 0.806 for running. The latter difference is probably due to the larger amount of arm motion. With the arms swinging vigorously the metabolism may be increased 125 per cent; yet we have inclined to ignore the importance of "minor motions." Another investigation shows that the metabolism is 3 per cent lower sitting in a steamer chair than lying flat in bed.[44] It is possible that the diminished pressure on the diaphragm when the body is supported in the inclined position lessens the work of breathing enough to account for the unexpected difference. The basal metabolism of normal boys twelve or thirteen years old is 25 per cent higher than that of adults, corrected for height and weight[45]—a very large increase. Obese subjects generally show no difference from lean in the basal metabolism, provided it is computed, not on basis of weight, but per unit of body surface, even though the obesity is of a most extreme type.[46] Considerable further work has been done on pathological subjects.

Comparatively few studies of the diet of groups of adults have been made during the past year. Gephart's[47] investigation of St. Paul's School was, of course, on adolescent boys, but is of great interest, because the boys consumed the extraordinary amount of 5000 calories per day. This was made up of 4350 calories supplied by the table and an additional 650 calories bought by the boys in chocolate, etc.

Very interesting as an application of recent work in nutrition to limited

[43] Benedict, F. G., and Murschhauser, H., Energy transformations during horizontal walking. *Carnegie Inst. of Wash., Publication* 231, (1915).

[44] Soderstrom, G. L., Meyer, A. L., and DuBois, E. F., A comparison of the metabolism of men flat in bed and sitting in a steamer chair. *Arch. Int. Med.*, 17, (1916), pp. 872–886.

[45] DuBois, E. F., The metabolism of boys twelve and thirteen years old compared with the metabolism at other ages. *Arch. Int. Med.*, 17, (1916), pp. 887–901.

[46] Means, J. H., The basal metabolism in obesity. *Arch. Int. Med.*, 17, (1916), pp. 704–710.

[47] Lusk, G., Food economics. *Jour. Wash. Acad. Sci.*, 6, (1916), p. 390.

conditions are two reports of Prof. A. E. Taylor of the University of Pennsylvania on the Conditions of Diet and Nutrition in the Internment Camp at Ruhleben, a camp for 3700 interned British civilians in Germany. He submitted the reports, after visits, through the United States Ambassador to the British Secretary of State for Foreign Affairs. The writer has not been able to see the full reports, merely the discussion of them in the *Journal of the American Medical Association*.[48] In the first, Taylor enumerates six criteria of what should constitute a complete, sufficient, and normal diet for such persons—from 70 to 90 grams of protein per day provided this contains all the needed amino acids; at least 30 calories per kilogram for those at rest or at light exercise, and a total of 3000 calories or more, if the body works; a certain amount of native fat, probably at least 25 to 50 grams per day, quite possibly necessary, not for the glycerides themselves, but for other components; the various salts required in the body; certain substances of unknown chemical nature, vitamines, found especially in vegetables and in the covering of grains; some food either freshly cooked or consumed raw. Also, Taylor says, some account needs to be taken of the habits, customs, tastes and idiosyncrasies of the subjects. The first six criteria were fairly well met, according to the first report, but the British dislike the German cooking. Also the food shipped in from England is like the food supplied by the Germans, poor in fat and rich in starch. The second report indicates a more serious situation, the diets furnished being essentially fat-free. Fish and margarin have been withdrawn.

The student of nutrition must be increasingly interested in the correct feeding of the population as a whole and therefore in all efforts to increase knowledge of diet and to correct abuse of the food supply. The twelfth Report of the Henry Phipps Institute of Philadelphia calls attention to certain very unsatisfactory conditions in that city. A recent comment[49] on the report may serve as a conclusion to this paper. "The control of the food supply of adults, to such an extent at least as to prevent disease, ... represents, doubtless, the most important question now occupying the minds of sanitarians, the practical application of which to municipal affairs will do a great deal to prevent the occurrence of many of the intestinal affections, at least, but probably of most others also, which still flourish in large cities."

[48] Editorial, A report on nutrition in a German internment camp. *Jour. Amer. Med. Assn.*, 67, (1916), pp. 125, 126. Food abuses in war times. *Ibid.*, 67, (1916), p. 515.

[49] Editorial, Municipal control of food materials. *Jour. Amer. Med. Assn.*, 67, (1916), p. 955.

SOME RECENT CONTRIBUTIONS OF BACTERIOLOGY TO THE HOME

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After considering some recent investigations of the pasteurization of milk, this paper will review a few papers upon the rôle of bacteria in nutrition or "bacteriotherapy" as it is sometimes called.

Considerable time and pains have been taken to establish a proper temperature at which to pasteurize milk. Th. Smith, Russell, Hastings, Hesse, Rosenau,[1] and others found that bovine tubercle bacilli in milk are not infective for guinea pigs when milk is heated at 60°C. for 20 minutes, and 60 to 63°C. (140–145° F.) has been established as the lowest safe temperature at which milk may be pasteurized and be free from pathogenic microörganisms.

There is no lack of evidence showing that raw milk is a very excellent carrier of infectious disease. Jordan,[2] in a splendid consideration of the subject of pasteurization of milk, has cited interesting figures. Of the cases traced to milk there is recorded a total of 346 outbreaks of typhoid fever, 137 epidemics of scarlet fever, 53 outbreaks of diphtheria, and 18 outbreaks of septic sore throat, besides cases of gastrointestinal catarrh, Asiatic cholera, anthrax, hydrophobia, hoof and mouth disease, and diarrhoea in infants. Cases are cited showing that the dairy causing the trouble was often faultlessly clean and neat, and the workers were cleanly, but proved to be innocent carriers of typhoid or diphtheria bacilli. The work of Park and Krumwiede,[3] who found that 6 to 10 per cent of deaths from tuberculosis in children under 5 years, in New York, is caused by bacilli of the bovine type, and the confirmation of this work by the British Royal Commission on Tuberculosis in 1911, leaves no doubt as to the effectiveness of heating milk as a safeguard against tuberculosis in children. There is some proof that the amount of infectious disease is lowered by the pasteurization of milk in cities where it is practiced. Rosenau, Lumsden, and Kastle observed that the lowest proportion of typhoid fever was on a milk route in Washington in 1906 and 1907 where there were sterilized bottles and pasteurized milk. Sta-

[1] Cited after Jordan, The case for pasteurization, *Jour. Amer. Med. Assn.*, 59 (1912), pp. 1450–7.

[2] Ibid.

[3] Cited after Jordan.

tistics are given for Chicago and Boston showing lowering in typhoid death rate after the pasteurizing rules were enforced.

Park and Holt[4] found a marked decrease in infant mortality which they attributed directly to pasteurization of milk.

The bone of contention with regard to the process has been rather thoroughly fought over. Such questions as this have arisen: Is it not a shelter for the unscrupulous dairyman? Is not pasteurization a means of disguising dirty milk? May not disease germs enter the milk after it is pasteurized and thus render it more dangerous than raw milk which has not the protection of a label? Is heated milk as digestible and nutritious as raw milk? Will pasteurized milk sour normally or will it peptonize and putrefy? Are the lactic acid bacteria all killed? If not, what relation do those surviving the process bear to the other milk bacteria which survive the process? What are the keeping qualities of heated milk? Does it develop an unpleasant taste and what is the cause of this? Some very interesting and careful work has been done with regard to all these questions.

We must pass over the enforcement of pasteurizing laws and other laws regarding clean milk supplies and go to the question of whether heated milk is as digestible and nutritious as raw milk. Brennemann[5] found that raw milk is more likely than boiled to produce large curds which hinder digestion. Janet Lane-Claypon[6] found that infants, like other young animals, thrive best on the milk of their own species, and that it is immaterial, so far as nutrition is concerned, whether the milk is boiled or not. Infants fed with milk drawn from the breast of a wet nurse, and boiled previous to use, appear to thrive just as well as when the same milk is given fresh. At the end of a year, babies fed on boiled milk show no greater percentage of rickets than breast babies.

With regard to the question, "Will pasteurized milk sour normally or will it peptonize and putrefy?" there is some diversity of opinion. Housekeepers and others handling pasteurized milk observe that it sours more slowly than raw milk and oftentimes develops a peculiar unpleasant taste and a disagreeable odor. These observations have led many to the opinion that the pasteurizing processes are not satisfactory and that the milk is left in a very undesirable condition. This

[4] *Arch. Pediat.*, 20 (1903), p. 881.

[5] Cited after Jordan.

[6] Report to Local Government Board, new Ser. No. 63, 1912, Abs. *Lancet*, London, April 27, 1912, p. 1140.

opinion is rather widespread and has stimulated considerable investigation of this point.

Flügge,[7] in 1894, found that bacterial spores survive the process of pasteurization and germinate. Three peptonizing species isolated caused death when inoculated into laboratory animals. Milk cultures fed to puppies caused illness and death. Flügge went so far as to state from these observations that pasteurized milk is "dangerous." Ford and Pryor[8] investigated this point with 78 samples of Baltimore milk taken from 21 dairies, and set out to confirm or deny Flügge's statement that "milk contains heat-resistant spores of aerobic and anaerobic bacteria which cause changes in milk, making it a dangerous article of diet." They concluded that such changes do take place when milk is heated anywhere from 65° to 100°C. and kept at anywhere from 22° to 37°C., but not when kept in the ice box at 4° to 6°C. The spores do, however, live for a long period when the samples are kept in the ice box. The authors found 65° to 85°C. to be a danger zone for pasteurization in which it will never clot normally. These investigators consider it safest to boil the milk from 10 to 30 minutes and then preserve it on ice. They state that it has not been chemically shown that the bacteria surviving pasteurization cause derangements in the metabolism of children. Tissier and Gasching,[9] studied the organisms concerned in the putrefaction of meat and milk. After the careful isolation and identification of these organisms, they concluded that "in the absence of predisposing causes, the bacteria concerned in the putrefaction of meat and milk are not believed to cause digestive disturbances and this is supported by experiments upon man and animals. Therefore, although subsequent workers have found spores of aerobes and anaerobes surviving pasteurization, there is, as Jordan[10] has said, no proof for Flügge's contention that "dangerous" peptonizing forms develop.

Colwell and Sherman,[11] found that pasteurization at 60°C. restrains peptonizing to the same extent as souring, and that apparently pasteurization has no constant effect in rendering the milk either more or less liable than raw milk to the development of offensive odors. Ayers and Johnson[12] have found that commercially pasteurized milk sours through

[7] *Ztschr. f. Hyg.*, 16 (1894), p. 272.
[8] *Bul. Johns Hopkins Hosp.* 25 (1914), pp. 270–76.
[9] *Ann. Inst. Pasteur* 17 (1903), no. 8, pp. 540–63.
[10] See 1.
[11] Cited after Jordan.
[12] U. S. Dept. Agr. Bur. Anim. Indus. Bul. 126, pp. 98.

the development of lactic acid bacilli which survive the heating process. They have divided the bacteria which resist pasteurization into four groups, namely acid formers, indifferent species, alkali formers, and peptonizing bacteria. According to these workers the percentage of acid formers is raised by pasteurization, while the other groups are diminished. The average percentage of lactic acid bacteria in raw milk is increased by heating for ½ hour at 62.8°C. (145° F.) from 1.27 per cent to 4.55 per cent. As long as the pasteurizing temperature is under 76.7°C. (170° F.) the heated milk possesses a greater part of the acid group. In temperatures over 76.7°C. the group of acid formers is for the most part destroyed and the remaining bacteria belong to the peptonizing group. When different grades of milk are pasteurized in the laboratory at 62.8°C. (145° F.) and kept at room temperature three different kinds of behavior are observed. In case of good milk the acid-forming bacteria quickly develop and overgrow the other species and a normal coagulation occurs. In pasteurized milk of poor grade, the group of peptonizing bacteria quickly develop, outgrowing the acid group; there is in the beginning a lab-like coagulation; it is soured in consequence of the lactic acid bacteria, but peptonized also. The third class includes those samples of good milk in which there is an overgrowth of peptonizing bacteria; the milk is peptonized without souring.

If milk is kept in the ice box at 10°C. the growth of peptonizing bacteria is held back and their significance is less marked. The percentage of lactic acid bacteria remains for a long time the same. Occasionally after 5 days the alkali formers predominate; at other times, the acid formers.

Weigmann, Wolff, Trensch and Steffen[13] have taken up the findings of Ayers and Johnson and have sought to confirm them. They had observed that milk pasteurized with the new continuous heating apparatus of Edward Ahlborn in most cases undergoes acid coagulation, but it often happens that after many days standing there occurs a change even when the pasteurized milk has the appearance of keeping. apparently there is a decomposition of the proteins. Bacteriological examination showed considerable numbers of protein-splitting bacteria accounting for the fact that the soured, coagulated milk had a bad taste. So-called "good" milk acted no differently from "bad" milk in this respect. Thorough laboratory investigation based upon these observations

[13] *Centbl. f. Bakt.*, 45 (1916), Abt. II, no. 115, pp. 63–107.

of practical experience confirmed Ayers' and Johnson's finding that the relative proportion of lactic acid bacteria to the other milk bacteria is increased after pasteurization at 60° to 63°C. for 30 minutes, and they concluded that there must be fewer of them killed than of the other milk bacteria. However, comparisons of growths in plain and in sugar calcium carbonate agar, made at frequent periods after pasteurization, have shown that lactic acid bacteria, even if they survive pasteurization in considerable numbers, are not able to bring about a normal souring, because their ability to multiply, as well as to form acid, is considerably diminished. After the milk is several days old the peptonizing species develop unhindered and bring about an unfavorable change. According to these investigators 99.86 per cent of the bacteria in milk are killed by heating at 63°C. for 30 minutes, that is, for 1000 bacteria in raw milk there are 1.4 remaining after pasteurization.

While it has been shown that there are enormous dangers in the consumption of raw milk in transmitting infectious disease, and while it has been proved that pasteurized milk safeguards infants against summer diarrheas and is no harder to digest than raw milk, yet the facts pointed out by Flügge and others indicate that there is still something lacking in the palatability and souring properties of pasteurized milk. It is still left for someone to perfect a method by which milk may be freed from its pathogenic organisms and still remain palatable on standing. As Bienstock[14] has suggested, the ideal would be milk prepared for use so that the pathogenic bacteria would be killed, while the lactic acid bacteria would remain alive. Since this is not possible one must resort to other means to give back to pasteurized milk the antiputrid properties of raw milk. One could add, to sterilized milk, cultures of the lactic acid bacillus, but there is a simpler means which Bienstock suggests. Since Bacillus coli and Bacillus lactis aerogenes occur in good water as well as in bad, he suggests the addition of tap water to sterilized milk.

Researches upon the harmless species which are parasitic to man are less widely known than those upon species which set up definite pathological processes, probably because of the tremendous importance of the latter in medicine and surgery. However, the literature is not lacking in studies upon the parasitic flora of the mouth, the skin, and the intestine. It is of the last mentioned that I wish to speak. The names of

[14] *Archiv fur Hygiene*, 39 (1901), p. 390.

Nuttall and Thierfelder, Metchnikoff, Schottelius, Escherich, Moro, Tissier, Bienstock, Rodella, Schmidt, Strasburger, Klein, Passini, Herter, and Kendall are as closely linked with the investigations of normal parasitic intestinal flora as are those of Koch, Shiga, Eberth, Pfeiffer, Gaffky, Gruber, Widal, Flexner, and others, with investigations of parasites which set up a specific disease condition in the intestines.

The classic researches of Metchnikoff, Nuttall and Thierfelder, and Schottelius upon the determination of the rôle of the bacteria of the intestine are too well known to deserve more than mention. Escherich, Moro, Tissier, and Rodella have been interested in the normal parasitic flora of children, while Bienstock, Passini, Metchnikoff, Herter, Kendall, and others have studied that of adults.

Since the sour milk therapy has become popularized very interesting papers have come out; and there is some definite information in answer to such questions as, Is it better to take butter-milk or Bacillus bulgaricus tablets? Is it possible by ingesting such acid resisting organisms as Bacterium acidi lactici, Bacillus bulgaricus or Bacillus acidophilus to establish them parasitically in the intestine, thereby preventing the development of putrefactive bacteria to which they are antagonistic?

Kendall[15] has pointed out that those species that are capable of fermenting carbohydrates and putrefying proteins always attack the former first and produce end products which are harmless and easily eliminated. Basing the treatment upon this observation and the further observation that pathogenic microörganisms elaborate less of their toxins when grown in sugar-containing media, Kendall gave lactose to infants in cases of bacillary dysentery. Theoretically at least, the advantages of such a diet are the following: (1) the dangers of the former starvation treatment are avoided; (2) the lactose absorbed spares protein in metabolism; (3) lactose is preferred by the bacteria and protein is spared in the intestine; (4) harmless products result from bacterial decomposition of carbohydrates while from proteins toxins may be produced; (5) lactose is the normal carbohydrate of infants and its slower absorption both avoids overloading the blood and prolongs its beneficial effects on intestinal conditions. Bacillus coli, a normal parasite, becomes antagonistic to Bacillus dysenteriae and forms acids which inhibit the growth of Bacillus dysenteriae. Of thirty-nine cases reported, 20 lived, 19 died; of the 19 that died 8 received no sugar.

[15] *Jour. Med. Research*, 25 (1911), p. 117.

Torrey[16] reported observations of the flora of typhoid patients. When a high calorie diet containing considerable carbohydrate was given the flora was simpler and more nearly resembled that of the nursling. When this simple flora was found (principally Bacillus acidophilus) the fever ran a mild course.

Rettger[17] found that chicks fed upon milk diet showed greater resistance to Bacillus pullorum, the bacillus of white diarrhea, than those given the ordinary chick feed. Rettger attributes this resistance to the lactose in the milk, and suggests that it is a property peculiar to lactose, for the other sugars did not give such a favorable result.

Rahe's[18] results concerning the so-called implantation of Bacillus bulgaricus throw light upon the question, Can one implant acid resisting organisms in the intestine as a safeguard against putrefaction? Even when a liter of a 48 hour-old culture of Bacillus bulgaricus was ingested the organisms did not become parasitic and disappeared from the intestine shortly after the ingestion of the cultures was stopped.

In summing up this point it may be said that a rational bacteriotherapy applicable to all classes of cases is not yet worked out. There is definite information concerning many of a normal parasitic species. Their morphological and biochemical activities are pretty definitely understood. Concerning their action in vivo the threshold has only been approached and complicating factors are met on every hand.

SUMMARY

1. The few recent contributions here cited offer excellent examples of the manner in which definite and reliable information is accumulating on subjects related to the problems of pure food and nutrition.

2. The enormous dangers in the consumption of raw milk lead us to look to pasteurization as a safeguard, even if, as careful experimentation and practical experience show, it leaves the milk in an imperfect condition. There is opportunity for perfection of the process.

3. With more knowledge of the biochemical properties of the bacteria of the digestive tract, with the study of their relationships in health and disease, will come an understanding of their rôle in nutrition.

[16] *Jour. Infect. Dis.*, 16 (1915), pp. 72–108.

[17] *Jour. Experimental Medicine*, 21 (1915), 365–88.

[18] *Jour. Infect. Dis.*, 16 (1915), p. 210–20.

Note. The University of Illinois Dairy pasteurizes its milk for city trade in a cream ripening fat with a steam coil at 140°C. for twenty minutes to one-half hour.

VITAMINES, OR LIFE-PRESERVERS

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The word "vitamine" may be translated "essential to life," and the translation may pass for a definition, since it is descriptive of nearly all that is known about this class of compounds. The definition sets no limits as to the chemical nature of the compounds that may be included as vitamines, because little is as yet known on that matter.

The name vitamine was given by Casimir Funk in 1912[1] to a preparation, made from the outer layers of rice grains, which was able to cure pigeons of the disease polyneuritis, brought on by a diet of rice from which the outer layers had been removed by the "polishing" process. He named the preparation "essential to life" because his experiments seemed to prove that it was the lack of this essential substance which brought on the fatal polyneuritis in pigeons and beriberi in men and women whose diet was restricted to polished rice. He very soon found yeast to be a very good material from which to obtain the life-preserving preparation, and since that time several investigators have prepared, from a number of different foods, substances which have shown a similar curative or preserving power against beriberi and other so-called "deficiency" diseases.

As long ago as 1897 Eijkman came to the conclusion that the prevalence of beriberi in the Far East is due to the custom in those countries of living for several months at a time almost exclusively on decorticated (polished) rice. Persons who used the unhusked rice or parboiled (cured) rice, which had been previously steamed to remove the pericarp, did not contract the disease. A large number of investigations followed this important discovery, and are still going on. Various theories have been advanced as to the cause of the disease. Theories of bacterial infection, of toxic substances in the food, and of phytin or other organic phosphorus deficiency, have all been enticing; but the vitamine explanation is now generally accepted.

Much of the experimental study has been carried out with pigeons, because in them the beriberi-producing foods very quickly bring on a well-defined condition of polyneuritis, which is probably the same as beriberi in man, and the cure of which may be used as a test of the

[1] Funk, *Jour. State Med.*, 20 (1912), pp. 341–368.

efficiency of any given food or treatment. In them cures with the anti-beriberi, or anti-neuritic, vitamine were first effected.

And the cures are fairly marvelous. As the disease develops, the birds become lame and inactive, lose weight rapidly, and are drawn out of shape, especially with the neck muscles so contracted that the head is laid over on the back. After reaching that condition, if left to themselves, they would usually die in twenty-four hours or less; but, if 2 to 4 milligrams of the vitamine preparation are injected intravenously, they revive and appear to be cured in less than three hours. If they are then fed on the normal corn diet, they show no return of the disease.[2]

Marvelous as the power of the anti-beriberi vitamine is, however, it seems to be but one of a class of agents upon which healthy life is dependent. As the work of Koch and Pasteur revealed to the world a group of living organisms infinitesimal, but nevertheless dominant as health preservers or destroyers, so also an inorganized group of infinitesimal health-preservers is being revealed in the train of the discovery of the anti-beriberi vitamine. An understanding of this vitamine group will surely be a help to the physicians and dietitians in the fight against disease.

Scurvy, for instance, has long been known to be associated with the use of a restricted diet lacking in fresh vegetables and meats. It frequently develops on shipboard when only bread foods and canned goods are used, also in times approaching famine. Fresh vegetables and fruits and their juices, and especially lime and lemon juices have been recognized as remedies which bring about a rapid recovery. It is now believed that the recovery is due to an anti-scorbutic vitamine, or to several anti-scorbutic vitamines, in the lemon juice and fresh vegetables. Epidemic dropsy, infantile scurvy, human multiple neuritis and peripheral neuritis, Basedow's disease, ship-beriberi, rickets, and pellagra have all been attributed to similar causes. All of these are thought to be due to deficiencies in the diet. The exact nature of the deficiencies has not been determined, but it may be that against each there is a specific vitamine.

Moreover, beside all these forms of minute extras in foods something else is there which makes young animals grow. Hopkins,[3] Osborne and Mendel,[4] McCollum and Davis,[5] and others have shown that artificial

[2] Funk, *Jour. Physiol.*, 48 (1914), p. 228.
[3] Hopkins, *Jour. Physiol.*, 44 (1912), p. 425.
[4] Osborne and Mendel, *Jour. Biol. Chem.*, 15 (1913), pp. 311–326.
[5] McCollum and Davis, *Ibid.*, 15 (1913), pp. 167–175.

mixtures of pure chemical compounds, however well selected and combined, do not support the growth of young rats, mice, and guinea pigs, for an indefinite time; but the addition of a small percentage of some natural food, such as egg-yolk, milk, or butter, or of yeast, is sufficient to restore and continue the growth. Evidently the growing animal requires something besides the food constituents usually considered, and the natural fresh foods supply that growth-stimulating accessory.

There is doubt at present as to whether this growth-promoting substance is to be classed as a vitamine. Funk's[6] attempt to prove that it is identical with the anti-beriberi vitamine of unpolished rice is not successful. This phase of the question is being actively studied. If the substances were present in larger amount and could be isolated individually, of course the identity or otherwise could be determined chemically; but as it is they must be judged purely from the physiological effects of preparations made under various conditions.

Most of the physiological experiments which have proved the existence of a distinctive growth-promoting substance have been either such as made use of a ration from which fat and the fat-like lipoids were excluded, or experiments in which the material added to reëstablish growth was one which contained fat as a somewhat prominent feature. In fact, with some species butter seems to be one of the best agents to use. It has therefore come about that the failure to grow has been attributed to the lack of lipoids; but unless Funk's analysis is misleading, if the growth substance is a lipoid, it is not vitamine. The theory of the lipoid nature may be incorrect. It has lost some of its support by the observation that none of the common lipoids introduced in a pure condition into the ration remove the deficiency.[7] It is quite possible that vitamine exists in combination in fat, or, because of its solubility, is taken out from the food by the processes used in taking out the fat. In that case, the injury supposed to be done by lack of lipoid may in reality be due to lack of the vitamine associated with the lipoid. Osborne and Mendel[8] feel that they have disproved that supposition with regard to butter. Butter, which is in the main a mixture of fats, does unquestionably possess a growth-producing power, and Osborne and Mendel find that power emphasized in the "butter oil" remaining after processes such as would tend to free it from the heavier fats and from substances other than fats. They say that the "butter oil"

[6] Funk and Macallum, *Ibid.*, 23 (1915), pp. 413–419.
[7] MacArthur and Luckett, *Ibid.*, 20 (1915), pp. 161–174.
[8] Osborne and Mendel, *Ibid.*, 16 (1913), pp. 423–437.

contains neither nitrogen nor phosphorus, and accordingly claim that it cannot include vitamine or a phosphorized lipoid. On the whole there is considerable indication of two types of accessory substances essential for growth, one of them lipoid in nature and the other not.

The question of the lipoid nature or the lipoid association of any of these food accessories has a bearing on the interpretation of their functions within the body. The functions must be judged from their location in the body when known, from such properties as can be ascertained, and from the symptoms produced by their withdrawal from the ration. Some of the animal tissues which have been found to be most rich in vitamine are tissues which are rich in lipoid, such as brain, heart muscle, and egg-yolk. According to the investigation of Miss Evelyn Cooper,[9] however, vitamine does not enter into the constitution of the brain or heart muscle and is not a lipoid. Evidence was obtained of a lipoid-like substance in brain and in egg yolk which has a marked affinity for vitamine. Very probably such a substance serves to hold the vitamine in store till needed by the organism.

With regard to the functions of the vitamines but little definite evidence has been collected as yet. The different symptoms produced indicate that they serve different purposes. The neuritic symptoms of beriberi have led to the thought that the anti-neuritic vitamine is essential for normal nerve activity, and in birds that have died from polyneuritis the nerve and brain tissue is found to be degenerated. The right side of the heart is very much enlarged in fatal cases of this disease, and of scurvy[10], and that has been explained as a secondary effect of nerve degeneration. None of this evidence indicates the exact work of the vitamine.

The extreme effectiveness of vitamines in proportion to their amount suggests a possible relation to the hormones, and other components of the internal secretions of such organs as the thyroid, thymus, and suprarenals. The view that there may be such a connection has some support from the fact that the glands of internal secretion in pigeons suffering from beriberi have been found to be greatly diminished in size and to show marks of structural degeneration.[11]

In still another direction are a few experiments which indicate that the carbohydrate metabolism is affected by the amount of vitamine supplied; a lack of vitamine in the diet resulting in an excessive con-

[9] Cooper, *Biochem. Jour.*, 8 (1914), pp. 347–354.
[10] Darling, *Jour. Amer. Med. Assn.*, 63 (1914), pp. 1290–1294.
[11] Funk and Douglas, *Jour. Physiol.*, 47 (1914), pp. 475–478.

version of the glycogen of the liver into sugar, and the addition of vitamine from yeast to such a diet being accompanied by a formation of glycogen in the liver and by less blood sugar. After a fat-free vitamine-free diet, the glycogen content of the liver was increased.[12]

A curious observation with regard to the effect of carbohydrate ingestion upon the vitamine requirement has yet to be interpreted. Several observers have noticed that with the diet of polished rice (lacking vitamine and rich in carbohydrate) pigeons succumb more quickly when large amounts are eaten. The same is true, to a less extent, with a vitamine-poor diet rich in protein or fat. It might be expected, naturally, that the opposite would be true, because with the very small amount of vitamine present in the rice it might be supposed that by eating a larger amount it would be possible to obtain a better protection. The unexpected reversal holds also in human beriberi. In nearly all epidemics reported it is observed that individuals who are well nourished so far as quantity of food is concerned are more liable to the disease than are the underfed. Bradden and Cooper[13] carried out controlled experiments with a view to determining whether the requirement for anti-neuritic vitamine is actually increased by an increase of carbohydrate ingestion. They conclude that it is and that for the maintenance of health "the intake of active substance must be adjusted, so as to stand in some quantitative relation to the ration of carbohydrate ingested, and it is when this necessary balance is not maintained in the dietary that beriberi results." The precise relation which must exist between the supply of active material and the amount of carbohydrate metabolized has not been ascertained, nor has it been determined for the protein and fat.

If such a relation holds as Braddon and Cooper think they have proved, it complicates somewhat the problem of the physician or dietitian who is fighting a deficiency disease by regulation of the diet. That is, he must the more insist on the use of a mixed diet with a liberal supply of the vitamine-containing foods, and he must at the same time urge the avoidance of a high excess of carbohydrate-rich foods. It is not probable that the relation between the amount of carbohydrate and the amount of vitamine needs to be adjusted in any very exact way, as their words might lead one to think; but a satisfactory balance is doubtless easily attained if attention be given to the two points mentioned.

[12] Funk and Schörnborn, *Ibid.*, 48 (1914), pp. 328–331.

[13] Braddon and Cooper, *Jour. Hyg.*, 14 (1914), pp. 331–353.

In selecting foods for their vitamines it is necessary to have in mind some of the processes which may lower the vitamine content. The removal from rice by the polishing process has been mentioned. It is found true also of wheat, corn, and other cereals that the larger part of the vitamine is contained in the bran portions. The coarser, unhulled cereal preparations, therefore, have more protective power than the fine bolted flours. Evidence of the injurious effect of a diet consisting largely of highly milled white flour is reported from Newfoundland and Labrador.[14] In mid-winter and spring, and in summer while they are on their fishing vessels the people are reduced to white bread and tea. At such times what seems to be true beriberi develops. Dr. Little testifies as to the cure:—"A patient with beriberi, whose symptoms have not gone so far as to be immediately dangerous, if put on a diet including fresh meat, whole wheat bread, beans, peas, macaroni, and potatoes, will, within ten days, recover from all functional symptoms." The same trouble attacks their hens. As the natives say, the hens fed exclusively on white bread and water "get leery and give up."

Another process which reduces the activity of food is drying. Fresh beans, peas, and other legumes are relatively rich in vitamines but the dried ones less so. Some foods lose their curative power simply by being kept, and canned goods usually have little. The anti-scorbutic vitamine is said to be much more stable than the anti-neuritic. The anti-scorbutic vitamine is fairly stable in acid media, which may be a reason why lemon juice has been found so effective a cure for scurvy. The anti-neuritic vitamine is soluble in water, and if unhusked or parboiled rice is soaked in an excess of water for some hours and the water thrown out, the rice loses some of its protective power. Probably the same would be true of other soaked foods. Solutions of the anti-neuritic substance lose their activity on being boiled a few minutes, especially if alkaline. Milk on being heated to 100° C. for some time loses its anti-scorbutic property, and, if forming the exclusive diet of children, may give rise to the appearance of infantile scurvy. The heating of milk has also been thought to be a cause of rickets in children.

Voegtlin gives the following table[15] of foods arranged with reference to their anti-neuritic and anti-scorbutic powers, in each case those richest in vitamine being placed first:

[14] Little, *Jour. Amer. Med. Assn.*, 58 (1912), pp. 2029–2030; 63 (1914), pp. 1287–1290; Ohler, *Jour. Med. Res.*, 31 [N. S. 26] (1914), pp. 239–246.

[15] *Scientific Monthly*, 2 (1916), p. 292.

ANTINEURITIC PROPERTIES		ANTI-SCORBUTIC PROPERTIES	
Relatively rich	Relatively poor	Relatively rich	Relatively poor
Brewer's yeast	Sterilized milk	Fresh vegetables	Dried vegetables
Egg yolk	Sterilized meat	Fresh fruits	Dried fruits
Ox heart	Cabbage	Raw milk	Sterilized milk
Milk	Turnips	Raw meat	Canned meat
Beef and other fresh meat	Carrots and other vegetables of this type		Dried cereals
Fish	Highly milled cereals		Pork fat
Beans	Starch		
Peas	Pork		
Oats			
Barley			
Wheat			
Corn			

As a practical rule resulting from the whole investigation of vitamines and their occurrence, so far as it has gone, it may be well to bear in mind the suggestions which Vedder made for the prophylaxis of beriberi. He recommends that: (1) If bread is the main article of diet, it should be made of flour containing the bran; if rice, it should be the unpolished. (2) Beans, peas, and other legumes should be eaten at least once a week. Canned legumes are to be avoided. (3) Fresh vegetables or fruit should be used at least once, better twice, a week. (4) Cereals (unhulled) should be included in all soups. (5) When corn is the principal article of diet, the yellow meal, that is, that made from the whole grain, should be used. (6) Potatoes and fresh meat should be used at least once a week, preferably daily. (7) The use of preserved foods is to be avoided.

These recommendations are made for subjects who have been on such a diet as to have reduced the supply of vitamine in the body to the dangerous point. It is evident that most classes in America do not need to give especial attention to the matter for themselves; but some groups are undoubtedly near the margin of safety, and the spread of pellagra among us, especially in the Southern States, is evidence of the need of preventive measures in some quarters. To the educated public in general doubtless the chief interest in the whole matter is to be found in the development of a new and vital field of investigation. It is to be expected that out of the investigations there will come many revelations with regard to normal physiological processes. To a student the literature of the subject is fascinating.

HOW THE SOLDIERS OF EUROPE ARE FED[1]

MRS. MELVIL DEWEY

The enormous task of feeding armies has been most carefully worked out in every detail. Some one has said: "The army travels upon its stomach." Soldier's rations must not only be adequate in amounts but must be carefully balanced, for the quality of the fight depends largely on the quality and quantity of the food. Supply trains carry traveling kitchens, field bakeries, and fireless cookers which are built into the carts. They are loaded up in the morning, at noon they halt and a supply of hot coffee, soup, or stew is ready to supplement the bread which the men carry in their haversacks. Fresh bread is given occasionally to relieve the monotony of hard tack. So large a working force and so many guards are required that this total service of the rear, as it is called, uses over 20 per cent of the men called into service. Old men are largely chosen for these duties so that the pick of the fighting strength stays with the fighting line. Every effort is made to supplement the diet by fresh meat and vegetables levied or bought in the immediate vicinity of the troops. This living off the country is carried much farther in Europe than in British and American practice. In home territory or friendly country, supplies are paid for at once; in hostile districts they are taken without payment.[2]

It is claimed that the Turks were the first to make a fixed allowance per capita in feeding their army. France boasts that her soldiers are the best fed of all; but the Russian is undoubtedly the most liberally fed of any of the armies of the world. Germany first worked out a scientifically balanced ration and has long held that she was supreme in this field, but England says:

> [The Germans learned] that in the art of provisioning an army they could teach nothing to the British, and that the completeness and efficiency of the German commissariat system was far excelled by that which . . . kept our men at the highest pitch of efficiency. (See London Times History of the War, Part 47, vol. 4, July 13, 1915.)

[1] Presented at the meeting of the Institution Economics Section of the American Home Economics Association, Lake Placid, 1915.

[2] Rules of land warfare. "Requisitions in kind shall not be demanded—except for the needs of the the army of occupation.—They shall be paid for as far as possible in cash; if not, a receipt shall be given and the payment of the amount due shall be made as soon as possible."

The staple items of the ration must stand heat and storage without serious loss in nutriment and flavor. In all nations these consist of about the same articles—fresh or salt meat, hard or fresh bread, rice and peas with small portions of sugar, salt, and coffee, varying in proportions according to national differences in custom which always play a powerful part in dietetic matters. A comparative table of rations is added, which has been compiled from material furnished by the War College in Washington, which is a translation from the Revue du Service de L'Intendance Militaire, vol. 26, 1913. Doubtless many changes have been made during the progress of this war but this list is considered authoratative up to 1914. Figures in brackets are not included in footings. No calories are given for British, Belgian, and Turkish rations, and no footings of grams for Austrian and United States.

TABLE 1

Army field rations compared, grams

	BRITISH	BELGIAN	FRENCH	ITALIAN	RUSSIAN	GERMAN	AUSTRIAN	TURKISH	UNITED STATES
Bread	567	750	750	750	1025	750	700	900	454
Butter								10	
or fat							20		
Meat	567	450	400	200	410	375	400	250	(396) or
Bacon	113		30	15					340
Cheese	85								
Vegetables, fresh	(226) or								
Vegetables, dry	57		60	50		17	250	100	113
Tomatoes									283
Coffee			16	10					32
Coffee conserve							50		
Tea	18								
Sugar	85	45	21	15	13	17			68
Jam	113								
Prunes									36
Salt	14								4.5
Crushed wheat								150	
Oatmeal					136				
Paste				(200) or					
Rice		30		180					
Wine				(250cc.)			(200cc.)		
Total grams	1587	1275	1277		1601	1319		1310	
Total calories			2943	3394	3702	3393	3278		4615

British and United States rations are estimated in pounds and ounces but for convenient comparison these have been translated into grams, 1 ounce being equal to 28.35 grams.

TABLE 2

Table showing components and quantities of various rations U. S. Army

A. GARRISON RATION		B. FIELD RATION			RESERVE RATION
Articles	Quantities	No. 1 quantities	No. 2 quantities	No. 3 quantities	Quantities
	ounces	*ounces*	*ounces*	*ounces*	*ounces*
Beef, fresh	14		14	14	12
Bacon, issue	3.6	12			
Flour, issue	18				16
Hard bread		16			
Bread			16	16	
Baking powder	.08				
Beans	1.2	4	4	4	
Rice	.8				
Potatoes, fresh	14		14	14	
Onions, fresh	4			2	
Tomatoes	2	10	5	2	
Prunes	.384	1.28	1.28	.384	
Jam	.64			.64	
Apples, evap.	.128			.128	
Peaches, evap.	.128			.128	
Coffee, R. & G.	1.12	1.12	1.12	1.12	1.12
Sugar	3.2	2.4	2.4	3.2	2.4
Milk, evap.	.5				
	gill			*gill*	
Vinegar	.08			.08	
Pickles	.08			.08	
	ounces			*ounces*	
Salt	.64	.16	.16	.64	.16
Pepper, black	.04		.02	.04	
Cinnamon	.014				
Lard	.32			.64	
Lard substitute	.32				
Butter	.25				
Oleomargarine	.25				
	gill				
Syrup	.32				
	ounces				
Flav. extract, lemon	.014				
Protein, grams	146.8	110.9	146.9	146.6	81.3
Fat, grams	173.5	236.8	143.4	161.5	234.2
Carbohydrates, grams	65a.9	510.0	479.7	506.9	404.9
Heat, calories	4761.0	4615.0	3797.0	4068.0	4052.0

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FREDRICK ACCUM AND HIS WRITINGS ON FOOD CHEMISTRY

ANNA H. WHITTELSEY

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Fredrick Accum was born in Buckeburg, Westphalia, in 1769.[1] Nothing is known of his early life, except that he was by profession a chemist. In 1793 he went to England where he soon made a name for himself as a teacher, lecturer, and consulting chemist. He became professor of chemistry in the Surrey Institution in 1809, where he lectured upon "Operative and Philosophical Chemistry," upon "Mineralogy," and upon the chemistry of arts and manufactures. He did much by his work and writings to promote the lighting of cities by gas. In 1822 he returned to Berlin where he remained as professor in a technical institution until his death in 1838.

He was the author of a number of scientific works, among others, A System of Theoretical and Practical Chemistry, a crystallography, several books on mineralogy, treatises on gas lighting, and two books of especial interest from the point of view of Home Economics, namely, Culinary Chemistry, published in 1821, and the Adulterations of Food, which antedates it by one year. These two volumes are of much value to students of Home Economics who wish to trace the development of the subject as a distinct branch of learning.

Accum in the first pages of his Culinary Chemistry states two truths of which the importance is not fully realized even today after a lapse of nearly 100 years—namely, that a kitchen is a chemical laboratory and that cookery is one of the least cultivated branches of chemistry. The amount of chemistry set forth in this book, however, is slight compared with that in "Adulterations of Food," and is chiefly interesting as showing a few of the quaint theories that were current at that time, especially in regard to the operations of cooking.

The effects of cooking meat by direct application of heat, for example, are said to be due to the development of gelatin and "osmazome" (extractive matter of meat) from the smaller vessels and a combination with these of a portion of the fat liquefied by heat.

The agreeable taste of roasted meat is due to "empyreuma, combined with a minute quantity of ammonia, which is soon developed on the sur-

[1] *European Magazine*, 77 (1820), pp. 483–486.

face of the fat, by the partial charring—not of the fat itself, but of the cellular membrane in which it is enveloped."

In the light of modern knowledge Accum's ideas in regard to the agency of oxygen in the putrefaction of canned goods are interesting. "The tin canisters being closed during the exposure to heat, must ne essarily contain with the included matter some portion of air." The effect of the heating is to produce a combination of the oxygen of the air with the included matter. If the combination is incomplete, putrefaction takes place. He proves these statements by reference to the well-known fact that a can which has been opened and closed again (thus letting in air) without application of heat soon putrefies; but after heat is again applied after closing the can the enclosed materials can be preserved as at first! A theory on this matter formulated by Gay-Lussac is quoted at length (page 217) but is called "rather hypothetical and unsatisfactory."

"Adulterations of Food" is of interest, both because it shows the conditions in England at this time in regard to the adulteration of food, and because it reveals the condition of the science of chemistry early in the nineteenth century. It is evident that the adulteration of food was gross and extensive and that its existence was quite unknown to the majority of people.

The adulteration of many food materials is discussed, including bread, alcoholic liquors, tea and coffee, cheese, spices, vinegar, cream, confectionery, catsup, and custards. There are chapters, also, upon water, including discussions of the characteristics of pure water and tests for impurities, and chapters upon the dangers of using copper and leaden utensils in the preparation of foods.

It is interesting to know that at this early date such practices were common as the sophistication of pepper by adding artificial pepper corns made from oil cakes, clay, and cayenne pepper; the adulteration of ground pepper by mixing it with pepper dust—that is, the sweepings from pepper warehouses, known as "P. D." and even the sweepings of the sweepings known as "D. P. D.," dirt of pepper dust; increasing the acidity of vinegar by the addition of sulphuric acid; the adulteration of confectionery by the substitution of clay for sugar and the use of coloring matters containing lead and copper.

Tests are given in most cases whereby the adulteration may be detected, provided such tests are known. Most tests are for inorganic substances, and such tests as those for the adulteration of foods with

deleterious vegetable substances were, as Accum says of such adulteration in the case of beer, "beyond the reach of chemical analysis." Ground coffee was adulterated with scorched peas and beans. As no method of detection was then known, advice was given not to buy *ground* coffee. All microscopic tests are lacking.

The tests are practically the same as those in use at present and include tests for magnesia, lime, sulphates, chlorides, carbonates, lead, copper, iron, calomel, alum, and tartaric acid. The hardness of water is tested by soap solution. Rice or arrowroot powder is detected by iodin, turmeric by its change of color with alkali, and dissolved oxygen in water is determined by the oxidation of ferrous sulphate or "nitrous gas."

A few quantitative tests are mentioned. For instance, the determination of the freedom of calcined magnesia from carbonates by weighing the material before and after treatment with dilute sulphuric acid.

The chapter on water analysis includes some quantitative tests to be applied in the analysis of the ash. Carbonates are determined by the difference in weight of the precipitate given by barium chlorid before and after treatment with nitric acid; chlorids by precipitation as silver chlorid and weighing; calcium as calcium sulphate; magnesium as magnesium phosphate; sodium as sodium chlorid; and iron by precipitation with ammonium benzoate and weighing as "protoxid."

The remarks upon the characteristics of good water for drinking and other purposes are interesting. Stress is laid upon the mineral constituents as affecting the softness of the water, which, according to Accum, is the most important quality of good water. Indeed most of the discussion on water hinges on the relative hardness or softness of waters from various sources. About 20 pages are devoted to the discussion of the dangers from lead in drinking water due to storage in leaden reservoirs, and the use of lead-lined pumps. The dangers from contamination of water with animal matter are dismissed with a few words. In regard to the amount of impurities that exist in the Thames, at London, after having received the contents of the sewers, drains, and water courses of a large town, it appears, "from the most accurate experiments that have been made, that those kinds of impurities have no perceptible influence on the salubrious quality of a mass of water so immense, and constantly kept in motion by the action of the tides." Accum does suggest, however, that the putrefaction of Thames water when used as sea store is due, in part at least, to the presence of this "prodigious accumulation of animal matters."

EVA M. BENEFIEL[1]

An Appreciation

MAMIE BUNCH
University of Illinois

In the passing of Miss Eva Benefiel, late County Adviser in Home Improvement for Kankakee County, Illinois, and probably the first woman to hold such a position in a northern state, the Home Economics movement has lost an able worker. Miss Benefiel was unusually well adapted for her work. She had lived on a farm and had experienced the labor conditions, isolation, and the inconvenient surroundings common to so many farm homes. She had taught in the rural schools and realized the magnitude of the school problems in sanitation, in nutrition, and in neighborhood coöperation. She had had four years' technical training in the Home Economics Department of the University of Illinois, followed by six years' teaching of Home Economics in high schools. She had demonstrated and lectured before women's clubs, teachers' institutes, and other organizations.

She was athletic, musical, seemingly in perfect health and carried always an impression of sunny optimism and abundant vitality. She entered heartily into any worthy community effort and was a natural leader. Little annoyances received scant recognition from her. She was too busy with the big, positive features of community development to pay attention to the discouraging talk of pessimists. But she succeeded in getting pessimists to listen to her assurance of possible achievements; in fact, she got them to do for themselves things they thought could not be done. She made Home Improvement a common cause in which all cliques and factions could unite. People who had lived in the same neighborhood for years without knowing each other save as members of different churches, different lodges, or different political parties were brought together in the common effort to improve home life in Kankakee County.

Miss Benefiel had a keen sense of values. She found something very good in every community to build on, and directed the effort in that region accordingly. Neighborhoods were not set at strife with each other in competition, but rather each community was led to contribute its share toward a collaboration which should show a wide range in

[1] Miss Benefiel was drowned while bathing in the Kankakee River, July 31, 1916.

home improvement and in community ideals. In one year she had shown to the women and girls of Kankakee County a great variety of ways of making farm and town life absorbingly interesting and worth while. Under her guidance the girls found commonplace tasks develop into interesting, individual problems, and the women wakened to a keener responsibility regarding neighborhood conditions.

That her vision was shared by the progressive women of the Kankakee County Home Improvement Association is shown by the fact that they will continue the work Miss Benefiel had so well begun. They have selected as her successor Miss Jessie Fay Edmundson, a young woman whose preparation for the work has been very similar to Miss Benefiel's.

Miss Benefiel recognized the necessity for systematic and supervised recreation for young people, and her last service to her girls was in directing the camp life of one of the clubs. Her sudden death recalls vividly a warning sounded by Miss Alice Ravenhill at the Seattle meeting of the American Home Ecnomics Association. Miss Ravenhill emphasized the lack of economy shown by enthusiastic Home Economics workers in spending their vital energy too freely. She pointed out how frequently it has happened that a woman, whose preparation, experience, and accomplishment had placed her where we might look to her for leadership, had died suddenly; her life snuffed out by some unusual shock from which the system was too fatigued to rally, because the ambitious woman had spent all her energy—forgetting the necessity for a reserve.

Miss Benefiel was so thoroughly interested in her project that even on her vacation, those who met her at Ithaca or in Washington will remember, her sole thought was to collect material and ideas for her work. It is much to be regretted that with her enthusiasm she had no idea of the cost of fatigue. Her work will go on, her influence remains, though we cannot but wish she might have continued here the project she had so well begun.

THE QUESTION BOX

To the JOURNAL OF HOME ECONOMICS:

"Can you tell me where I can find material or where I can visit an institution that has worked out scientifically the organization of a girls' dormitory along modern lines of hygiene and efficiency? I want to inform myself on the number of employees required, hours, division of duties, privileges, and other questions of organization, and also as to kitchen and dining room equipment. The School is to be in the Middle West and the scale of living is that which parents expect when they pay $500 or $600."

This question has been answered tentatively by letter. Can some one of our readers give the information needed or refer us to schools where these problems have been worked out?

A request has come for literature on this subject:

"*Resolved* that the average woman on the farm does not receive her due proportion of the family income for home conveniences."

Can any one furnish references?

Question: A physician has granted the use of lemons to a patient but refused her oranges, apparently on the ground of the difference in the kinds of acid present. Is there any justification for this?

Answer: The preclusion of oranges from the diet of a patient who has been granted the use of lemons, on the ground of the difference in the kind of acid present, is not justified, since lemons contain from 6 to 9 per cent of citric acid, while oranges contain from 1 to 2.5 per cent of citric acid.

FOR THE HOMEMAKER

CHILDREN'S CHRISTMAS GIVING

ERNESTINE P. SWALLOW

Every opportunity to train children so that in later years they shall be generous, happy, and wise givers should be used, and Christmas offers a special chance to give this training in a natural and simple way.

The joy that belongs to those who give and those who receive; the sacrifice that is a part of true giving; the thoughtfulness that considers the needs and tastes of the recipient; the self control that limits gifts to one's legitimate resources; the sense of social responsibility that forbids harming any one, even remotely, through giving: these may be learned unconsciously at Christmas time far more effectively than they could be taught by precept.

Part of the delight of giving is in choosing the gift. The parents who buy things themselves and merely hand them over to the children to give, or who put the children's names, as the givers, on gifts they have had no part in selecting, deprive those children of their rights and of an understanding of the real happiness that lies in doing for others.

Underlying true giving there must always be the spirit of love and sacrifice. The gift that costs us nothing is of small value in the giving. Therefore the children should earn the money, or at least a certain portion of it, with which to buy their gifts for Christmas, or save it at some sacrifice of their own pleasure. They should also put thought and work into their giving. As many gifts as possible should be of their own making, and, when this cannot be, they should at least be of their own choosing, and there should be some personal touch, if only a message written by their own hand, for "the gift without the giver is bare."

Children should learn to be thoughtful givers, deciding wisely to whom to give and what to give. With the mother's help they should make a list of those to whom they are to send Christmas remembrances. No name should appear there, where a gift would mean to the children only the payment of a debt. To give to anyone just because one has

given to us is an unworthy motive and makes the gift, as a gift, valueless. Find out those to whom the children would like to give as an expression of their love and friendship, and help them add to this list some to whom they can give because the gifts are needed or because they will bring happiness. Help them decide with care and thought and needed advice what their gifts shall be. See that as far as possible the gifts are something that will give pleasure in themselves. Teach them that to select gifts that come within their means is only common honesty and that part of the value of the gift lies in the thought it carries.

Begin early with the Christmas gifts, not only because it makes possible a wiser selection of gifts and a real enjoyment of the buying and making, but because buying early relieves the sales people in the stores of the fearful strain so general at Christmas time; and teach the children that this consideration is part of the Christmas spirit. The rush and haste of leaving things till the last minute lessens one's own pleasure, and may cause needless unhappiness to others.

Most of all, be sure the children know the real reason for Christmas giving, "God's best gift to us," the little Child who was born on Christmas day.

THE HOUSEHOLD REFRIGERATOR[1]

MINNA C. DENTON

It has been wisely said that ordinary milk which has been kept for twenty-four hours at a temperature above 50°F., should not be fed to a baby without being scalded,—even if it has not yet soured. Similarly, other perishable foods, such as meats, eggs, and cream, which have to be kept for some days or even hours in the home, ought to be stored at a temperature below 50°F. if possible. Yet the average cellar, even in northern states, does not as a rule maintain a temperature lower than 60° to 65°.

If the reader will test the temperature of her own refrigerator with a thermometer she will doubtless discover that it ranges between 50°

[1] Copyrighted.

and 60°, or occasionally a little higher or lower, according to the location of the thermometer in the refrigerator, the degree of excellence of the refrigerator, and the room temperature (weather) on the day when the test was made. Moreover, it is safe to say that through the summer, in many if not in most localities in the United States, a box which will constantly maintain as low a temperature as this, will require 150 pounds or more of ice a week—or else there is something unusual in the circumstances or in the treatment it receives. Yet according to Dr. John R. Williams, Secretary Milk Commission, Rochester, N. Y.,[2] the efficient refrigerator or ice-box should have a temperature not in excess of 50°F., preferably below 45°;[3] and it should use about one-third to one-fifth the amount of ice now consumed by the average box.

The trouble is, that the housewife who buys the refrigerator judges it according to finish and general appearance, whereas the detail upon which its efficiency depends is the amount and kind of insulation furnished between inner and outer walls. This insulation may be sawdust, charcoal, mineral wool, felt, vegetable fiber, cork filings, or cork board; in a cheap box it may be nothing but a layer or two of paper. Whatever it is, it is probably packed densely into the air space which is inside the wall, so as to prevent circulation or currents of air; for a dead-air space is the poorest conductor, or the best non-conductor of heat which has yet been devised for such a purpose as this. In order to be truly "dead," however, the air space must be minutely subdivided into small compartments which are kept more or less separate from each other.

This insulating material should also be non-absorbent of moisture, particularly if the box has a painted or galvanized metal lining, which will, of course, in time rust sufficiently in corners and crevices to allow some of the moist air or even water to gain access to the insulating material. Not only does this absorbed moisture lower the efficiency of the insulating material, but it will also in time warp and rot the wood casing, and cause the doors to become ill-fitting; this allows direct leakage of warm air into the box.

It will be observed that all of the cheaper insulating materials mentioned above do absorb moisture very readily. The superority of sev-

[2] A Study of Refrigeration in the Home, and the Efficiency of Household Refrigerators. Read at the Third International Congress of Refrigeration, September, 1913.

[3] Circular 65 Bureau of Standards mentions 45° to 50° F. as suitable temperatures for the household refrigerator. State laws and city ordinances concerning transportation of milk supplies frequently specify 50° or below during summer weather.

eral inches' thickness of good cork board over some of the other materials so commonly used, is apparent; and though it will add several dollars to the cost of the refrigerator, that money will be returned to the consumer during the first six months of its use, in the form of saving on ice bills. At least, so figures Dr. Williams.

More important still, this added insulation secures the lower temperature needed to make perishable foods safe. At least three inches of such insulation (exclusive of thickness of wooden case and metal or tile lining) should be supplied, and the retailer who sells the box should exhibit a small sample section of the wall showing the amount and character of this insulation.

Lining of the Refrigerator. The lining of the food chambers should be white, so that it may show at once the presence of dirt or of materials which have been spilled on it. Seamless vitreous or porcelain enamel, such as is used on bathtubs or lavatories, makes a protection for the metal lining which is far superior to the coat of white enamel paint found in the less expensive grades of ice boxes, though it is not at all impossible to keep the white painted lining in good condition for a few years at least. Glass, tile, and solid porcelain slabs are sometimes used to line refrigerators; any necessary seams or joinings should be tightly and smoothly cemented together, *not* joined by strips of metal whose edges may easily become soiled, or harbor, upon occasion, cockroaches, or even bacilli.

In general it may be laid down as a safe rule, that if the manufacturer's name and address do not appear on the box, he has not produced an article of which he is proud nor one of any great value.

Tight fitting doors (not bevelled) with latches that hold when pressed firmly shut, constitute a detail of importance.

Location of the refrigerator. The refrigerator can not be expected to give its best service if located in a warm place; this fact is a serious drawback toward placing it either in the kitchen or in an outside wall upon which the sun shines. If possible, if should be set where it will be cold enough in winter not to need ice. An ideal arrangement would be to have it set or built into an inside wall between pantry and back entry or covered porch; this gives opportunity for the iceman to fill it without tracking through the kitchen, and yet the door to food chambers opens into the pantry. The convenience of having the refrigerator placed near the kitchen work table, is perhaps somewhat exaggerated by some writers on household administration. The cellar, however, does seem

decidedly too inconvenient a location, and is likely also to be musty, and too dark to be sure of absolute cleanliness. The wise housekeeper plans her work so as to open the ice-box door as seldom as possible; if she can manage so that this occurs only ten or twelve times a day, so much the better, in the interests of ice economy as well as of food sanitation.

The drip pipe of the refrigerator commonly closes at the bottom with a sort of trap holding a light water seal which prevents the warm outside air from entering the box at this point. Some inches below this is set a larger basin with trap, and waste pipe leading away from it. This waste pipe is sometimes led outside the house to a gravel or tile drain which carries the water from the house; or sometimes it empties itself above a basement fixture or open trap which is connected with the house sewer. This series of traps and broken connections makes it practically impossible for the sewer air ever to enter the refrigerator—an occurrence which would be highly undesirable from the esthetic standpoint, to say the least, apart from any (exceedingly remote) possibility of carrying infection into food.

Care of the refrigerator. The water drippings from melting ice, and the surfaces over which it passes, are not sterile even though they may be thoroughly clean from the housewife's standpoint. On the contrary, certain slime-producing organisms flourish well in these cool, dark, damp places; and though they are not in the least dangerous to health, they do clog up the pipes in time. Besides this slime, there is usually more or less dirt and debris coming from the ice; and so the drip pipe is made removable for most of its length, and should be thoroughly scrubbed out every two or three weeks, as should also the removable cups in the traps. An occasional flushing with hot washing soda solution tends to "cut" this slime and prevent its accumulation.

The inside of the food chamber should be kept as clean as are the dishes into which food is put,—mainly for esthetic reasons, since it is difficult to conceive of household conditions such that food could ever become infected with disease-producing or "ptomaine"-forming organisms coming from the walls of the refrigerator. A thorough scrubbing of walls with soap suds, washing powder, or disinfectant, will not often be necessary if pains be taken to wipe up every slop and spill at the time it occurs.

Ice should not be wrapped in paper or blankets to keep it from melting. Only by its melting can the food chamber be kept cool.

AN ADEQUATE DIET

The interest of late years in the subject of diet has resulted in many books and articles written by those who at most have the "little knowledge" that "is a dangerous thing." Unproved "facts" have been stated as truths; faddists have exploited their own opinions; alarmists have implied dangers that are at least remote; and, worst of all, half-truths have been given, difficult to deny, yet often most misleading.

It is only within a comparatively short time that we have had a "fundamental basis for nutrition." It is good to know that many experts in research and knowledge are now interpreting their results for the benefit of those without technical training.

Dr. Graham Lusk of Cornell Medical School, Dr. Lafayette Mendel of Yale, Dr. Percy Stiles of Harvard, have each given in most readable form, within the compass of a fifty cent book, the main facts that have been established. Others have published short papers that need little or no interpretation to make them useful to the homemaker. One of these by Dr. McCollum of Wisconsin, has lately appeared in the *New York Medical Journal*. He has not only pointed out the "essential factors in a successful diet," but has shown how these have been determined. He says:

> Our knowledge of this subject has come through persistent experimenting with rations made up of purified food stuffs. With such diets, employing rats as experimental animals, the writer has now had a continuous experience covering nine years. The evidence appears to be convincing that we are now in possession of an adequate theory concerning what constitutes a successful diet.
>
> If a young rat is placed upon a diet consisting of purified protein, carbohydrate, a vegetable fat such as olive oil, and an inorganic salt mixture made up in imitation of the mineral content of some ration of ordinary food stuffs with which normal nutrition has been secured, no growth can take place. The reason for this is that this mixture, although it contains all the food principles which are ordinarily laid down in textbooks on nutrition, still lacks two chemical factors which are essential for growth or prolonged well being. The evidence for this assumption is as follows:
>
> Suppose we prepare and add to this ration a water or alcoholic extract of some natural food stuff, such as peas, rice polishings, or wheat, which has been found effective in the cure of beriberi, and which therefore contains what has been designated vitamine. Even with this addition no growth can be secured.

If, however, we add to this mixture of purified protein, carbohydrate, vegetable fat, and salt mixture, both the extract described above and four or five per cent of butter fat, the food mixture becomes adequate for growth from weaning time to the normal adult size, and supports reproduction and the rearing of young. Certain other fats may be substituted for the butter fat, viz., egg yolk, fat or fats from the cells of animal organs; but thus far no vegetable fats have been found which contain enough of the unknown something to induce growth at the normal rate. It is present in certain vegetable foods, especially in the leaves of plants, and therefore in that part consumed in large amounts by the herbivora, but to much less degree by other animals. The corn and wheat kernels contain some of it, but the amount is too low for normal growth, while the oat kernel seems to have less than the other two named. In none of the cereal grains have we found a content of this substance sufficient to meet the demands of a growing animal.

The chemical nature of both these things is unknown.

The water soluble substance (vitamine) is widely distributed in liberal amounts in our naturally occurring food stuffs, but is not present in starch, cane sugar, polished rice, or in any of the fats of either animal or plant origin.

Now let us consider what such experimental results mean. If an animal can grow to maturity, reproduce, and rear young on a monotonous diet of purified protein, carbohydrate, butter fat, and salt mixture, to which a little water or alcoholic extract of a grain is added it is evident that all the complexes essential for complete nutrition are present in the mixture. There is abundant experience to prove that the protein of the ration may be a phosphorus-containing one, such as casein from milk, or it may be a phosphorus-free protein as albumin of egg. The young animal can draw all the phosphorus needed from simple inorganic phosphates, which are furnished in the salt mixture added to its food. In the course of many trials I have never seen growth enhanced by the addition of organic phosphorus compounds.

All the iron can likewise be drawn from inorganic forms of iron, since in the diets employed in our work the iron was supplied only in the form of citrate or lactate.

It should be emphasized that proteins are by no means of equivalent values as sources of nitrogen. There are some proteins which, if taken singly, are insufficient as sole sources of nitrogen for a growing animal.

Dr. McCollum concludes from continued experiments, that while some organic constituents of food, long thought indispensable, may be supplied in other forms, there exist two indispensable dietary factors not recognized until lately. These are often called food accessories.

The practical application of their discovery lies in the increased

emphasis on the advantage of a mixed diet, and, in case of a restricted diet, the necessity of paying especial attention to their inclusion.

The following are some of the books and papers dealing with diet that are especially valuable to the householder.

An Adequate Diet. By Percy Stiles. Harvard University Press, Cambridge, Mass., 1916, pp. 48. $0.50.

The Fundamental Basis of Nutrition. By Graham Lusk. Yale University Press, New Haven, Conn., 1914, pp. 62. $0.50.

Changes in the Food Supply. By Lafayette Mendel. Yale University Press, 1915, pp. 61. $0.50.

The Mineral Nutrients in Practical Human Dietetics. By E. B. Forbes, JOURNAL OF HOME ECONOMICS, March, 1916, pp. 122–130.

Food Selection for Rational and Economical Living. By C. F. Langworthy, JOURNAL OF HOME ECONOMICS, June, 1916, pp. 313–318.

The Essential Factors in a Successful Diet. By E. V. McCollum, *New York Medical Journal*, April, 1916, pp. 838, 839.

EDITORIAL

Free Reference Home Economics Library. The establishment of a free reference library in Home Economics in New York by the National Special Aid Society, reported in the news columns, is a long step forward in the work for the homemakers of this country. The public libraries have been helpful, but they have unfortunately not had the information to discriminate between the books that give accurate information and those that are amateurish and often full of extraordinary misstatements. The public libraries also, and naturally, put the greater part of the Home Economics books into the circulating department, and the homemaker who makes an effort to get to the library for help in her housekeeping problems is discouraged to find that all the books are "out." She is also puzzled to choose among them those particularly suited to her need. Only a person with Home Economics training can help her in this, and no small part of the importance of the new library is that there this has been provided. It is to be hoped that other cities will soon be provided with similar collections and librarians, either as part of the regular public library work or as the enterprise of some special group like the one in New York.

The Ellen H. Richards Home Economics Memorial Fund. The trustees of the Richards Memorial Fund are sending out a letter asking that each reader of the JOURNAL and member of the Association make a personal contribution toward the increase of the Fund by sending one dollar for Home Economics Day, December 3, 1916. The Fund is now over $4,000 and it would be nearly doubled if this plan should be carried out.

That the Fund be completed is the great desire not only of those who knew Mrs. Richards but also of those who believe that the American Home Economics Association has real work to do for the home. Many individuals have given to it already and many schools have raised money for it through plays, teas, or in other ways, but we must do much more if we are to have a fund so large that its income may accomplish the work that is offering itself.

There seems to have been some confusion between this fund and the Ellen H. Richards Research Fund and because of this some have thought our fund already completed.

In January, 1913, there was presented to the Massachusetts Institute of Technology a fund of $15,000, in memory of Mrs. Richards, to be known by her name, and to be used for research work in sanitary chemistry. This is administered by the Institute, in Mrs. Richards' own department.

The Ellen H. Richards Home Economics Memorial Fund, on the other hand, is being raised by the American Home Economics Association, and is controlled by a board of trustees elected by the Council of that association. Mr. Frederick B. Pratt of Pratt Institute is Chairman of this board, and Dr. Andrews of Teachers College, Secretary-Treasurer.

The fund is invested and only the income is to be used for "advancing home economics in fundamental ways by research and publication" and practical social service.

So far this income has been expended chiefly on the various publications listed under the name of the Richards Memorial Fund. Many of these are by their sale already bringing in returns.

"The Best Laid Plans." It was the plan of the Editor and the JOURNAL Board, with the coöperation of the Science Section, to make this December number of the magazine largely a review of the investigations and research recorded from August, 1915, to August, 1916. It was hoped that these might be presented in such a way as to be of real service not only to the college teacher but to those teaching in the high schools, and to the householder as well.

Many things have interfered so that the plan has been only partially carried out. We believe, however, that Miss Blunt's article alone would justify the attempt we made. Early in the year similar reviews will appear covering other subjects.

ANNOUNCEMENT

The Richards Memorial Fund Committee are collecting material for a biographical sketch of Mrs. Edna Day Hyde. They ask that all who have letters, biographical facts, notes on talks, addresses, lectures, or courses from which selection may be made, send them to Dr. B. R. Andrews, Teachers College, Columbia University, New York City, or to the JOURNAL.

BOOKS AND LITERATURE

Any book or periodical mentioned in this department may be obtained through the JOURNAL OF HOME ECONOMICS if the Journal price is listed.

A History of the Family as a Social and Educational Institution. By WILLYSTINE GOODSELL. New York: The Macmillan Company, 1915, pp. 588. $2.00. By mail of the Journal, $2.14.

Present-day homes and family relationships are a subject of such widespread discussion that a new study of the situation by a recognized authority is welcomed alike by the casual reader and the student. Those who have struggled with the scattered and scanty suitable material of the past, realize what a prodigious study and effort is represented in Goodsell's History of the family as a Social and Educational Institution and feel a corresponding gratitude for such substantial and masterly aid as it affords.

No theories concerning the social relationships of the family can be valued which are not based upon a careful and intelligent study of the past. This volume presents a painstaking historical survey from the earliest primitive forms of marriage to the present. With rare human touch and interest the narrative covers the Hebrew, Greek, and Roman types, the family of the Middle Ages, the Renaissance, the English family of the seventeenth and eighteenth centuries and, finally, the American family from the Colonial period to the present. The position of woman in the home and family life of these different periods, her rights, restrictions, opportunities, and duties, are all graphically pictured. Significant modifications due to the influence of conquests, the introduction of Christianity, industrial changes and racial characteristics are traced in illuminating fashion.

One comes, finally, to the closing chapters, which consider present problems and prevailing theories concerning family stability, the disharmonies evidenced in increasing divorce, the decline of the birth rate, the future status of woman, and the like, with a consciousness of the excellent preparation of the previous chapters for saner and more intelligent judgment concerning these perplexities in our social order. The natural, subtle argument of the book paves the way for the next progressive step as that of woman's fuller emancipation with increased power and opportunity. The conviction of her capacity to meet the enlarged responsibilities grows as one traces the results of her increased influence in the past.

One is especially grateful for the optimism and assurance of steady growth and progress which characterizes the book. It is very refreshing and heartening in the midst of its more sombre contemporaries. It is seldom that an author is so happy in being able to present an appeal to so varied a reading public, and at the same time give to the literature on this difficult subject such a scholarly contribution.

BERTHA M. TERRILL.

General Science. By LEWIS ELHUFF. Boston: D. C. Heath and Company, 1916, pp. viii + 438. $1.20. By mail of the Journal, $1.32.

No demand on the school is more urgent today, than that it shall give boys and girls an opportunity to study a science which meets pupil needs. The purpose of this book is, of course, to meet this demand. The crux of the problem which presented itself to the author was to interpret correctly pupil needs and then adopt that method which best meets that need.

The author very properly made the pupil, —his health, interests, experiences, environment—the focusing point. This being the basis of selection of subject matter, we find discussed in this book topics which have, in the main, a practical bearing and a real sig-

nificance socially. In this category belong such topics as health, ventilation, city water supply, artificial lighting, how to care for the soil, and many others. These are the topics which meet pupil and community needs as far as subject matter goes and these he has given adequate and illuminating treatment.

There are forty-two chapters. At the end of each chapter appears a series of questions and exercises. They are descriptions of experiments to be performed at home or questions calling for an application of the facts and principles learned. The excellence of these questions and exercises is a feature of this book. They are a distinct help to the teacher who wants to give real live science instruction.

The author is more fortunate in his book than in the statement of his pedagogical creed. It has not been established as stated in the preface that "repetition of fundamentals until they become a part of the pupil is the secret of successful science teaching." The fundamentals of science are not the most fundamental things, i.e., the end and aim of science instruction. There is a growing conviction that science in schools has suffered much from this practice of drilling in fundamentals. The growth of "general science" is, in a large measure, a protest against this conception of science teaching. But pupils do not read prefaces and that which the author conceives to be the highest aim and purpose of science teaching is not evident in the printed page of the text.

This book is a faithful compilation of scientific facts and principles worth while. The teacher needs this kind to attain the highest purposes of science instruction and on this ground the book deserves careful consideration. ROLAND H. WILLIAMS.

The Science of Home Making. By EMMA E. PIRIE. Chicago: Scott, Foresman and Company, 1915, pp. 392. $0.90. By mail of the Journal, $1.00.

This textbook is intended for use in the grammar and lower high school grades; and it covers an enormous territory, amazingly well, for the most part. Notwithstanding the largeness of its title, it is devoted chiefly to foods and cooking; yet laundering, home nursing, infant feeding and care, household accounts and family budget, house furnishing and decoration and care, pure food laws, table manners, intestinal segmentation, agar jellies for bacteriological studies, all receive some brief attention.

The recipes are very numerous and highly varied; in fact, they furnish one of the best features of the book, though errors, presumably typographical, have crept in once or twice at least.

The author has a happy faculty of treating complicated matters in simple language and concise fashion; as when she disposes of "the balanced ration" in a few well-chosen words, which though they explain little and omit much, can hardly prove misleading, in the large view. Her practical points in housewifery are most helpful. The greater part of her material is well up to date.

In the effort to cover so much territory, however, it is inevitable that some misrepresentations must occur. "If the supply of oxygen is deficient the digestion is slow" (importance of fresh air), "silver plate is hard to keep in order," "use thin, light enameled ware for (cooking of) foods containing much acid or soda," "shelves and towel rods of glass are most hygienic for the bath room," "one-seventh (of the daily 3000 calories) should come from proteins, two-sevenths from fat," "though some authorities recommend a greater proportion of protein,"—these are some of the things we feel inclined to dispute.

It will take an unusually good teacher to carry through successfully with such young students some of the exercises suggested; e.g., pp. 44 and 45 (digestion experiments, food analysis), p. 49 (table of digestive enzymes), p. 56 (make out several daily balanced rations—at the very beginning of the food study). One has a feeling, that if all of the work here outlined were really carried out, there would be little left for succeeding courses to accomplish.

MINNA DENTON.

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NEWS FROM THE FIELD

ANNUAL MEETING OF THE AMERICAN HOME ECONOMICS ASSOCIATION, CORNELL UNIVERSITY, ITHACA, NEW YORK, JUNE 28—JULY 2, 1916

Within a few days the *Proceedings* of the annual meeting are to be published and a copy will be sent to active members as one of the regular Bulletins of the Association. These proceedings will contain all the papers presented except such as are printed in the JOURNAL, and these will be summarized.

A brief account of the meeting was given in the August JOURNAL, and this more formal report is added chiefly for those who do not wish the full proceedings.

The ninth annual meeting of the American Home Economics Association was held at Cornell University from June 28 to July 2, 1916. In addition to the General Program, there were meetings of the Institution, Extension, and Science Sections, Conferences on Cafeteria Management, Laundry Management, Dietetics, and Budgets, and the Program of the Committee of Fifty for Journalism.

Institution Section

The first session of the Institution Section was held on Wednesday, June 28, at 9.30 a.m. Miss Emma H. Gunther, Secretary, acted as Chairman in the absence of Miss Sarah Louise Arnold. The meeting, with the subject—Students' Food—was opened by Miss Elizabeth Goodrich of Simmons College who read a paper on Service at a Dormitory Table. Problems connected with the choice and service of food were discussed in the light of personal experience by Miss Lord, Miss Goodrich, Miss Watson, Miss Loomis, and Mr. Proudman.

A second meeting of the Section was held on Wednesday evening, June 28, at 8 p.m., at which Prof. Wm. Morse Cole of Harvard University presided. Prof. C.-E. A. Winslow of the School of Medicine, Yale University, presented a paper on Sanitary Surveys of Institutions in which he enumerated the most important factors and discussed the methods most likely to meet with success in carrying out the survey. Miss Henrietta Roelofs, Household Employment Commission of the Y. W. C. A., New York City, read a paper on Studies of Labor Problems in Household Employment. There was an extended discussion of various problems connected with service.

Extension Section

The meeting of the Extension Section was held on Wednesday, June 28, at 9.30 a. m Miss Laura Comstock presided in the absence of Miss McCheyne. A paper on the Purpose of the Extension Section was read by Miss Comstock, this meeting being the first anniversary of the founding of the Section. The other papers presented were: The Relation of the Extension Staff of the University to the Regular Department of Home Economics, by Mamie Bunch, State Leader in Home Economics Extension, University of Illinois; Courses of Instruction for Extension Workers, by Elizabeth Kelley, University of Wisconsin; How We Conduct the Work in Florida, by Agnes Ellen Harris, State University, Tallahasee, Florida; Financing the Home Demonstration Work, by D. W. Working, U. S. Department of Agriculture; and Home Demonstration Work in the South by Ola Powell, U. S. Department of Agriculture. Miss Van Rensselaer explained the program and opened

the discussion of the "County Agent." This subject was discussed further by Miss Kelley of Wisconsin, Miss Pritchett of Maryland, Miss Hayes of Connecticut, Miss Comstock of Massachusetts, Miss Rowe of Minnesota, Mrs. Warner of Massachusetts, Mr. Forestahl, County Agent of Cortland County, New York, and Miss Benefiel of Illinois. Junior Extension Work was discussed by Mr. Griffin and Miss Titsworth of Cornell.

At the afternoon session reports of committees were read and officers of the Section were elected as follows: Miss Neale S. Knowles of Iowa State College, Chairman, and Miss Edith Parrott of Wnthrop College, Secretary.

On June 30 at 9 a.m., Mr. Forestahl talked on Results in Home Surveys; this was continued at the afternoon session.

Science Section

The sessions of the Science Section were held on June 28 at 9.30 a.m. and 2.30 p. m. The following papers were presented: The Digestibility of Starch as Affected by Various Processes of Cookery, Amy Louise Daniels, University of Wisconsin; Practical Ways of Increasing the Iron Content of the Diet, Caroline L. Hunt, Department of Agriculture; The Most Favorable Temperatures for the Cooking of Some Typical Foods, Louise Stanley and May Wallace, University of Missouri; Recent Contributions to Knowledge of Mineral Metabolism Grace McLeod, Pratt Institute; The New Dietetic Treatment of Diabetes Mellitus, Lenna F. Cooper, Battle Creek, Michigan; Recent Contributions of Bacteriology to the Home, Mrs. Josephine Kerr Allison, Urbana, Ill.; Creatin and Creatinin in Excretion, Mrs. Emma B. Wagner, University of Missouri; Coöperation Between the Home Economics Department and the Hospital, Ruth Wardall, Iowa State University.

On June 30, at 3.30 p.m. the adjourned meeting took the form of an informal questionnaire and Drs. DuBois and Langworthy answered questions regarding various phases of nutrition. At an adjourned meeting at 7.00 p.m. the following officers were elected: Chairman, Ruth Wheeler, University of Illinois; Secretary, Lenna F. Cooper, Battle Creek.

General Program

The General Program extended through June 29 and 30. The following papers were read, relative to housing: The Development of the House, by Helen Binkerd Young, which discussed the factors to be considered in planning a house; Practice Houses for Students in Home Economics, by Isabel Ely Lord, in which were described the practice houses at Pratt Institute where students work out the problems of housekeeping; and the Housing Problem, by Lawrence Veiller, which discussed unhygienic conditions due to dark rooms, overcrowding, and lack of proper toilet facilities, both urban and rural.

At the Conference on Health, Prof. C.-E. A. Winslow read a paper on Public Health in the Past and in the Future and Dr. Foster read a paper by Dr. William F. Snow on The Relation of Home Economics Education to Social Hygiene. At the evening session, Mr. Alvin E. Dodd read a paper on Training Women to Earn—A National Movement. In the discussion of this paper considerable information was given regarding the Smith-Hughes bill for vocational education. Miss Ward and Miss Powell of the U. S. Department of Agriculture spoke of the work in Home Economics Extension under the Smith-Lever Act.

On June 30 at 9.30 a.m. Mrs. Mary Schenck Woolman read a paper on Medium Priced Linens for Institution and Home; Miss Celestine Schmit one on The Teaching of Sewing and Miss Ethel Ronzone one on The Standardization of Women's Clothing. Prof. Wilder D. Bancroft spoke on Chemistry and Cooking, and Dr. E. M. DuBois read a paper on The Basal Energy Requirement of Man.

At 2.00 p.m. a Conference was held on Elementary Education in Home Economics at which Mrs. Martha French presided. Papers were presented by Miss Adelaide L. VanDuzer

on Home Economics Equipment, and Miss Ada Z. Fish on the Penn Family, which described the methods of teaching Home Economics used in the William Penn High School, Philadelphia, Pa. At the same hour a Conference of Administrative Workers was held at which Miss Josephine Berry presided, and one on Social Work in Home Economics at which Miss Emma A. Winslow presided.

The Program of the Committee of Fifty for Journalism

The Chairman of this meeting was Miss Anna M. East of Philadelphia, Pa. The following papers were read: Training the Pen to Keep Step with the Laboratory, by Mrs. Alice P. Norton; The Editors Blue Pencil, discussed by Anna Barrows, Mrs. Jessamine Chapman Williams and Helen Louise Johnson; Our Writing Laboratory—The Papers, by Harry R. O'Brien; Why the Business World Needs Experts who Can Write, by Mrs. Grace R. Wilmot; How Uncle Sam Writes, by C. F. Langworthy; Writing Your Own Press Notices by Mamie Bunch; Charting Your Way, by Geo. E. Farrell; and Balancing Menus for Print, by Lenna F. Cooper. The subject of Filling the Gap—How to Cover the Distance Between the Domestic Science Expert and the Editor was discussed by Isabel Bevier and Marie Sellers, and letters were read from James Tower and Mrs. Janet McKenzie Hill on the subject. Other papers presented were Planning My Magazine, by Leonarda Goss; Helping Farm Homemakers to Study their Business, by Harriet Mason; The Possibilities of a Woman's Page in the Daily Newspapers, by Mrs. Eva Hansl; Writing for the Family of Low-cost Standards, by Florence Nesbit, and Printing in Response to Request, by Elizabeth McCracken.

Conferences and Special Meetings

At the Conference on Cafeteria Management, Miss Anna M. East described the cafeteria of the Curtis Publishing Company and a number of problems in the work were discussed by Miss Goodrich, Miss Riley, Miss Lord, and others.

At the Conference on Laundry Management, Miss Balderston reported the results of a study of the relative costs of laundry work in various parts of the United States and in British Columbia, and various phases of Laundry work were discussed.

Special meetings attended by a large number of dietitians were held. Miss Lenna F. Cooper of Battle Creek, Mich., acted as Chairman, and Miss Rena S. Eckman of Massachusetts General Hospital, Boston, as Secretary. At these meetings special topics were discussed and certain measures were recommended toward future work in connection with the dietitian problem.

The committee which was appointed at the annual meeting in 1915 to investigate problems relative to the training of the different types of dietitians made its report at a special sectional meeting. The questionnaire method of the previous year was again used, this time being sent to dietitians instead of the hospital superintendents.

About twenty replies were received. The answers commented upon the length of the course of training for dietitians, the deficiencies which had been found in their past training, and made recommendations for future additional courses, and suggested other questions which required some consideration, such as hospital ethics, and relation to the administrative staff.

On the evening of July 1, a conference on budgets was held at which Dr. Andrews presided. After the opening remarks by Dr. Andrews the following papers were presented. Budget Studies, by Mrs. Mary Hinman Abel; The Cost of Living of College Students, by Sara MacLeod; The Clothing Budget, by Ethel Ronzone; Budgets of Families in Narrow Circumstances, by Winifred Gibbs; and Methods of Keeping Cash Account Records in the Household, by William Morse Cole.

On Sunday afternoon, July 2, a Community Meeting was held at which Dr. A. R. Mann presented a paper on The Home and the Community.

A Free Reference Library on Home Economics, has been opened at 259 Fifth Avenue, New York City, in the rooms of the National Special Aid Society. A librarian trained in Home Economics (Miss Eunice Doggett, Pratt Institute Normal Household Science, 1913) is in charge.

The National Special Aid Society in its work for "preparedness" has a Committee on Home Economics, with the following membership: Mrs. Annie Nathan Meyer, Chairman; Eva Barnard, Laura Cauble, Frank Curtis Gephart, Mabel Kittredge, Isabel Ely Lord, Frank Manny, Mrs. Ellen Rushmore McKeon, Mrs. Mary Schwartz Rose, May Van Arsdale, and Florence Winchell.

This committee believes that an important part of preparing for homemaking is the making available the best printed matter on the subject. The Home Economics Association of Greater New York has given hearty coöperation to the committee and owns the books. The National Special Aid Society provides quarters and pays the librarian's salary.

The library contains books approved for the purpose by the Committee on Home Economics, government bulletins, and the publications of Home Economics departments of colleges and universities. The library has been most fortunate in receiving a gift from Miss Margaret Loring Thomas of the first six volumes of the JOURNAL OF HOME ECONOMICS, lacking only the following numbers, Volume II, No. 2, Volume III, Nos. 2, 3, and 5. The committee hopes very much that someone who has these numbers will contribute them. The set will then be bound.

The JOURNAL is the only periodical that will be part of the library, but it is the intention to clip the files of other magazines, when articles of value are published, and to have this material classified and made available.

The library is absolutely free, and teachers as well as homemakers are urged to use it.

The American Association for the Advancement of Science and about forty national scientific societies affiliated with it will meet in New York City from December 26 to 30, 1916, under the auspices of Columbia University, New York University, the College of the City of New York, The American Museum of Natural History, and the other scientific and educational institutions of the city. Dr. Charles R. Van Hise, president of the University of Wisconsin, will preside. For further information apply to L. O. Howard, Permanent Secretary, American Association for the Advancement of Science, Smithsonian Institution, Washington, D. C.

Brief Notes: Prof. Marion Talbot, of the Department of Household Administration at the University of Chicago, and Dean of Women, has recently been made chairman of the new committee on public health for the Woman's City Club of Chicago.

Dr. Nellie Esther Goldthwaite, who has resigned her position in New Hampshire College, will travel for a year or more in Japan and the Orient.

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